VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. III YEAR
ELECTRICAL AND ELECTRONICS ENGINEERING

V SEMESTER **R22**

<table>
<tr><th>Course Code</th><th>Title of the Course</th><th>L</th><th>T</th><th>P/D</th><th>CH</th><th>C</th></tr>
<tr><td>22PC1EE301</td><td>Power Electronics</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>22PC1EE302</td><td>Power Systems – II</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>22PC1EE205</td><td>Control Systems</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>22PC1EE303</td><td>Sustainable Energy Solutions</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td></td><td>PROFESSIONAL ELECTIVE – I</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>22PE1EE301</td><td>Utilization of Electrical Energy</td><td rowspan="5">3</td><td rowspan="5">0</td><td rowspan="5">0</td><td rowspan="5">3</td><td rowspan="5">3</td></tr>
<tr><td>22PE1EC306</td><td>IoT Architectures and Applications</td></tr>
<tr><td>22PE1EC320</td><td>Fundamentals of Signals and Systems</td></tr>
<tr><td>22PC1EC208</td><td>Computer Organization and Design</td></tr>
<tr><td>22PE1EC321</td><td>Introduction To VLSI Design</td></tr>
<tr><td></td><td>OPEN ELECTIVE – I</td><td>3</td><td>0</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>22PC2EE301</td><td>Power Electronics Laboratory</td><td>0</td><td>0</td><td>2</td><td>2</td><td>1</td></tr>
<tr><td>22PC2EE205</td><td>Control Systems Laboratory</td><td>0</td><td>0</td><td>2</td><td>2</td><td>1</td></tr>
<tr><td>22MN6HS302</td><td>Gender Sensitization</td><td>2</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td colspan="2">Total</td><td>20</td><td>0</td><td>4</td><td>24</td><td>20</td></tr>
</table>

L – Lecture T – Tutorial P – Practical D – Drawing CH – Contact Hours/Week
C – Credits SE – Sessional Examination CA – Class Assessment ELA – Experiential Learning Assessment
SEE – Semester End Examination D-D – Day to Day Evaluation LR – Lab Record
CP – Course Project PE – Practical Examination

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD
B.TECH. III YEAR
ELECTRICAL AND ELECTRONICS ENGINEERING

VI SEMESTER **R22**

Course Code	Title of the Course	L	T	P/D	CH	C
22PC1EC321	Microcontrollers and Interfacing	3	0	0	3	3
22PC1EE304	Electrical Measurements and Instrumentation	3	0	0	3	3
22HS1MG301	Principles of Management and Organization Behaviour	3	0	0	3	3
	PROFESSIONAL ELECTIVE – II					
22PE1EE302	Electrical Drives	3	0	0	3	3
22PE1EE303	Special Machines and Control					
22PE1EE304	Energy Storage Systems					
22PE1EE305	Soft Computing Techniques in Electrical Engineering					
22PE1EE306	Advanced Processes and Control					
	OPEN ELECTIVE – II	3	0	0	3	3
22PC2EE304	Electrical Measurements and Instrumentation Laboratory	0	0	2	2	1
22PC2EC321	Microcontroller and Interfacing Laboratory	0	0	2	2	1
22HS2EN301	Advanced Communication Skills Laboratory	0	0	2	2	1
22PW4EE301	Internship	0	0	4	4	2
22MN6HS301	Ancient Wisdom	2	0	0	2	0
Total		**17**	**0**	**10**	**27**	**20**

L – Lecture T – Tutorial P – Practical D – Drawing CH – Contact Hours/Week
C – Credits SE – Sessional Examination CA – Class Assessment ELA – Experiential Learning Assessment
SEE – Semester End Examination D-D – Day to Day Evaluation LR – Lab Record
CP – Course Project PE – Practical Examination

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PC1EE301) POWER ELECTRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Circuit Theory, Network Analysis, Electronic Devices and Circuits

COURSE OBJECTIVES:
- To design/develop suitable power converter for efficient control or conversion of power in drive applications
- To design / develop suitable power converter for efficient transmission and utilization of power in power system applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the operating characteristics of various power electronic devices and their protection
CO-2: Analyze operating principles of different converters and find their applications
CO-3: Apply the control methodologies for various power electronic converters

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	1	2	3	-	2	1	-	2	2	3	3
CO-2	3	2	3	1	2	3	-	1	2	-	2	2	3	2
CO-3	2	2	3	3	2	3	-	1	2	-	2	2	3	2

UNIT-I:
Power Semiconductor Devices: Thyristors – Silicon Controlled Rectifiers (SCR's) – Power BJT – Power MOSFET – Power IGBT and their characteristics. Operation of SCR – Static and Dynamic characteristics of SCR - Salient points - Two transistor analogy–Specifications and Ratings of SCRs, Power BJT, MOSFET, IGBT, natural and forced commutation (Elementary treatment), Basic gate driver circuits. GaN and SiC Power MOS devices: Advantage of high bandgap materials, High bandgap material physics, various GaN/SiC devices.
Protection of Devices and Circuits: cooling and heat sinks, snubber circuits, current protection

UNIT-II:
Phase Controlled Converters
Single Phase Fully Controlled Converters: Bridge connections with R, RL and RLE loads- Derivation of average load voltage and current - Performance parameters of single-phase full bridge converter, Effect of source inductance – Numerical problems.
Three pulse and six pulse converters – Bridge connections, average load voltage with R and RL loads - Numerical Problems.

UNIT-III:
DC Regulators: Introduction and Necessity of DC regulators, Isolated and Non isolated dc to dc converters. Non isolated buck and boost converters: Power circuit, operation, circuit design, analysis and waveforms at steady state, duty ratio control of output voltage, relation between duty ratio and average output voltage, Numerical Problems.

UNIT-IV:
PWM Inverters: Introduction, Principle of operation, performance parameters, single phase bridge Inverters: operation, Harmonic Analysis.
Three Phase Inverters: 180 degree conduction, 120 degree conduction.
Voltage Control of Single Phase Inverter: single pulse modulation, multiple pulse modulation, sinusoidal pulse modulation. Voltage control of three phase inverter, Numerical Problems.

UNIT-V:
AC Voltage Controllers: principle of phase control, Single phase AC voltage controllers with R and RL loads-wave forms – Derivation of RMS load voltage – Numerical problems
Cyclo Converters: Cyclo converters – Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only), Introduction to matrix convertor.

TEXT BOOKS:
1. Power Electronics: Circuits, Devices and Applications, M. H. Rashid, Pearson Education, 2009
2. Power Electronics, P. S. Bimbhra, Khanna Publishers
3. Power Electronics: Converters, Applications and Design, N. Mohan and T. M. Undeland, John Wiley & Sons, 2007

REFERENCES:
1. Fundamentals of Power Electronics, R. W. Erickson and D. Maksimovic, Springer, 2007
2. Power Electronics, P. C. Sen, Tata McGraw-Hill Education
3. Thyristorised Power Controllers, S. R. Doradla, A. Joshi, R. M. K. Sinha, G. K. Dubey, New Age Books
4. Power Electronics, M. D. Singh, K. B. Kanchandhani, 2nd Edition, Tata McGraw-Hill, 2006
5. Power Electronics: Essentials and Applications, L. Umanand, Wiley India, 2009

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee03/preview
2. https://www.coursera.org/learn/power-electronics

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PC1EE302) POWER SYSTEMS – II

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Linear Algebra and Advanced Calculus, Power Systems-I, Circuit Theory, Electrical Machines-II

COURSE OBJECTIVES:
- To evaluate power system network matrices
- To perform load flow studies
- To analyze symmetrical and unsymmetrical faults
- To analyze power system stability

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Formulate Y-bus and Z-bus matrices
CO-2: Solve load flow problems using different techniques
CO-3: Determine fault currents for symmetrical and unsymmetrical faults
CO-4: Analyze power system stability and apply various methods to improve it

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2												3	3
CO-2	2	2			1				3			2	3	3
CO-3	2		2						2		1	2	3	3
CO-4		2	1	1					2	2	1	2	3	3

UNIT-I:
Power System Network Matrices: Graph Theory: Basic Concepts-Branch, Link, bus Incidence Matrix, Formation of Bus Admittance Matrix using direct inspection and singular transformation methods- Numerical Problems. Formation of Zbus: Algorithm for Modification of Zbus Matrix for addition of an element for the following cases - Addition of an element as a link, Addition of an element as a tree branch.

UNIT-II:
Power Flow Analysis: Introduction, Classification of buses, Formulation of static load flow equations, Solution techniques using Gauss Seidel Method with and without PV bus, role of acceleration factor, Newton Raphson Method in Rectangular Coordinates Form, Numerical problems up to 3 bus system.

UNIT-III:

Symmetrical Fault Analysis: Per-Unit System: p.u. Representation of a transformer, p.u. equivalent reactance network of Power System - Numerical Problems. Short circuit Current and MVA Calculations, Fault limiting Reactors- Generator reactors, Bus bar Reactors and Feeder Reactors - Numerical Problems.

UNIT-IV:

Unsymmetrical Fault Analysis: Symmetrical Component Theory: Symmetrical Component Transformation, Sequence Networks: Positive, Negative and Zero sequence Networks for transformers, transmission line and synchronous machine, Numerical Problems. LG, LL, LLG faults, Interconnection of sequence networks, effect of fault impedance, Numerical Problems.

UNIT-V:

Stability Analysis

Steady State Stability Analysis: Concept of steady state, Dynamic and Transient Stability. Derivation of Swing Equation, Power Angle Curve. Determination of Steady State Stability limit, Synchronizing Power Coefficient, steady state stability improvement methods, numerical problems.

Transient Stability Analysis: Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion: Sudden change in Mechanical Input, Sudden loss of one of parallel lines, Sudden short circuit on one of the lines-Short Circuit at one end, away from line, transient stability improvement methods.

TEXT BOOKS:

1. Power System Analysis, Grainger and Stevenson, Tata McGraw-Hill, 2020
2. Electrical Power Systems, C. L. Wadhwa, 8th Edition, New Age International, 2022
3. Modern Power system Analysis, I. J. Nagrath and D. P. Kothari, 5th Edition, Tata McGraw-Hill, 2022

REFERENCES:

1. Elements of Power System, Stevenson, Tata McGraw-Hill
2. Power System Analysis, A. R. Bergen, Prentice Hall
3. Power System Analysis, Hadi Saadat, Tata McGraw-Hill
4. Computer Techniques in Power System Analysis, M. A. Pai, Tata McGraw-Hill
5. Power System Analysis, B. R. Gupta, Wheeler Publications

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/108/105/108105067/
2. https://archive.nptel.ac.in/courses/108/104/108104051/

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PC1EE205) CONTROL SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Ordinary Differential Equations and Laplace Transform

COURSE OBJECTIVES:

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

COURSE OUTCOMES: After completion of the course, the student should be able to
CO -1: Analyze the stability, steady state and transient performance of a system using time and frequency domain analysis
CO-2: Evaluate the effects of feedback on system performance
CO-3: Obtain the model of system using transfer function/ state space models
CO-4: Design suitable controller or compensator for the improving system performance

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	2	3				1	1		1	3	2
CO-2	3	3	3		1		1		1		1		2	2
CO-3	3	3			3		1	3	1				3	1
CO-4	3	3	3	2	3	3	2	1	3	2	1	2	2	2

UNIT-I:
Introduction to Control Problem: Open-Loop and Closed-loop systems, effects of Feedback. Mathematical models of physical systems. electrical analogous circuits of mechanical systems Transfer function models of linear time-invariant systems –RLC Circuits, DC and AC servo motors. Block diagram algebra and Signal Flow Graphs.

UNIT-II:

Time Response Analysis: Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorems. Design specifications for second-order systems based on the time- response

Stability: Concept of Stability, Routh-Hurwitz Criterion, Relative Stability analysis.

UNIT-III:

Root-Locus Technique: Construction of Root-Loci

Frequency-Response Analysis: Bode plots- transfer function from bode plot-phase and gain margins- stability analysis. Polar and Nyquist plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margins. Relationship between time and frequency response.

UNIT-IV:

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design- Application of Proportional, Integral and Derivative Controllers. Design specifications in frequency-domain. Frequency domain methods of design- Lead and Lag compensators.

UNIT-V:

State Space Analysis: Concepts of state variables. State space model - RLC circuits and DC motor, canonical forms. State Transition Matrix and its properties- Transformations: State space to Transfer function and vice versa. Eigen values and Stability Analysis. Concept of controllability and observability.

TEXT BOOKS:

1. Control Systems Engineering, J. Nagrath and M. Gopal, New Age International, 2009
2. Modern Control Engineering, K. Ogata, Prentice Hall, 1991
3. Control systems Engineering, Norman S. Nise, 8th Edition, Wiley Publications, 2019

REFERENCES:

1. Modern Control Systems, Richard C. Dorf and Robert H. Bishop
2. Automatic Control System, B. C. Kuo, Prentice Hall, 1995
3. Control Systems: Principles and Design, M. Gopal, McGraw-Hill Education, 1997

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PC1EE303) SUSTAINABLE ENERGY SOLUTIONS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To inculcate sustainable choices in wake of present global scenario
- To raise awareness on the importance and opportunities available in the field of sustainable energy
- To raise entrepreneurs with understanding of technical and economic aspects of sustainable energy solutions

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Enrich their understanding of present energy scenario to realize the importance of sustainability
CO-2: Understand different ways of generating and utilizing energy in a sustainable manner
CO-3: Appreciate the role of EV as a sustainable energy solution
CO-4: Understand the various underlying economic aspects

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	1	2	3	3	2	1	-	2	2	3	3
CO-2	3	2	3	1	2	3	3	1	2	-	2	2	3	2
CO-3	2	2	3	3	2	3	3	1	2	-	2	2	3	2
CO-4	2	1	-	2	1	3	3	-	-	-	3	1	3	1

UNIT-I:
Global Energy Scenario: Concept of Sustainability (Social, Economic and Environmental impacts). Sustainable and non-sustainable energy sources. Present global and Indian scenario. Bureau of energy efficiency. Initiatives and incentives for promoting sustainability. UN 2030 goals for clean and affordable energy.

UNIT-II:
Sources of Sustainable Energy: Working principles of: Solar Thermal Power Generation, Solar Photovoltaic Power Generation, Wind Power Generation, Hydro Power Generation, Biomass Power Generation, Hydrogen energy and fuel cells and Wave and Tidal Energy.

UNIT-III:

Sustainable Utilization of Energy: Smart grid technologies - overview, penetration of renewable energy sources. Energy storage technologies. Renewable energy to Hydrogen. Waste to energy: waste to value added materials, capture, storage and utilization of CO2 from various sources to ensure cyclic carbon economy.

UNIT-IV:

Sustainability Through e-mobility: Electric vehicles. Advantages and environmental impact. Regenerative braking. Hybrid electric vehicles, modes of operation. Grid-to-Vehicle (G2V) and Vehicle-to-Grid (V2G) Technologies-fundamentals.

UNIT-V:

Energy Economics and Management: Cost analysis, interest, accounting rate of return, Payback, Discounted cash flow, Net present value, Internal rate of return, Inflation and life cycle analysis of energy systems.

Energy Management: Definition, objectives, resource conservation, climate protection and cost savings

TEXT BOOKS:

1. Energy, the Environment, and the Sustainability, 1st Edition, Efstathios E. Michaelides, CRC Press, 2018
2. Modern Electric, Hybrid Electric and Fuel cell vehicles, Mehrdad Ehsani, Yimin Gao, Stefano Longo, Kambiz Ebrahimi, 3rd Edition, CRC Press, 2018
3. Energy Economics Concepts, Issues, Markets and Governance, 2nd Edition, S. C. Bhattacharyya, Springer, 2019

REFERENCE:

1. Renewable Energy: Power for a Sustainable Future, G. Boyle (Editor), 3rd Edition, Oxford University Press, 2012

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/112106318
2. https://nptel.ac.in/courses/127103236

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PE1EE301) UTILIZATION OF ELECTRICAL ENERGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Electrical Machines, Circuit Theory

COURSE OBJECTIVES:
- To make the student familiar with electrical energy and its use when it is converted into several forms of energy
- To deal with the fundamentals of illumination and its classification and the electric heating and welding
- To learn the different types of speed time curves in traction system

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand various components of industrial electrical systems
CO-2: Understand the basic principles of illumination and its design
CO-3: Describe various methods of electric heating and design of heating element
CO-4: Understand the principles of electric welding
CO-5: Describe existing electric traction systems, speed-time curves for different services and Mechanics of Train movement and specific energy consumption

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	3	2	2							2	1
CO-2	3	2	1	1									2	1
CO-3	3	2	1	1									2	1
CO-4	3	2	2	3	2	2							2	1
CO-5	3	2	2	3	2	2							2	1

UNIT-I:
Electrical System Components: LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practice

UNIT-II:

Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

UNIT-III:

Electric Heating: Electrical heating-advantages, methods and applications, Resistance heating, design of heating element, efficiency calculations. Induction heating: Core type and Core less furnaces and high frequency eddy current heating, dielectric heating: principle and applications – Problems.

UNIT-IV:

Electric Welding: Definition of Electrical welding. Welding Processes. Electric welding-advantages and disadvantages, Types of welding-resistance and arc welding, Electric welding equipment, comparison between A.C and D.C Welding. Testing of welding joints.

UNIT-V:

Electric Traction: Electric traction--types, Review of existing electric traction systems in India. Special features of traction motor, Modern 25 KV A.C. single phase traction systems: advantages, equipment and layout of 25 KV single phase A.C. traction system. Simplified speed time curves, Average and scheduled speed - Quadrilateral and Trapezoidal speed time curves-Problems. Mechanics of train movement: Adhesive Weight, coefficient of Adhesion, tractive effort and specific energy consumption, factors affecting specific energy consumption-problems.

TEXT BOOKS:

1. Electrical Wiring, Estimating & Costing, S. L. Uppal and G. C. Garg, Khanna Publishers, 2008
2. Electrical Design, Estimating & Costing, K. B. Raina, New Age International, 2007
3. Utilization of Electric Energy, E. Openshaw Taylor, Orient Longman Private Limited, 1971
4. Art & Science of Utilization of Electrical Energy, Partab, Dhanpat Rai & Sons
5. Utilization of Electric Power and Electric Traction, G. C. Garg, Khanna Publishers

REFERENCES:

1. Electrical estimating and costing, S. Singh and R. D. Singh, Dhanpat Rai and Co., 1997
2. Utilization of Electrical Power including Electric Drives and Electric Traction, N. V. Suryanarayana, New Age International,1996
3. Generation, Distribution and Utilization of Electrical Energy, C. L. Wadhwa, New Age International, 1997
4. Utilization of Electrical Power, J. B. Gupta, Kataria Publishers

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/108/105/108105060/ (illumination)

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PE1EC306) IOT ARCHITECTURE AND APPLICATIONS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To terminology, technology and applications of IoT
- To sensors and actuators required to build an IoT system
- To necessary wireless networks and protocols
- To raspberry PI3 as a hardware platform for IoT sensor interfacing and
- To various IoT application as case studies

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Able to learn sensors and actuators required to build an IoT system
CO-2: Build a simple IoT System for a given application
CO-3: Describe and utilize necessary protocols for communication and management of an IoT system
CO-4: Design, develop and illustrate IoT applications using Raspberry PI platform and Python Scripting
CO-5: Design of case studies using IOT for manufacturing, health care, agriculture and entertainment

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	2	2	-	-	-	-	-	-	-	-	-	2	1
CO-2	2	2	3	-	-	-	-	-	-	-	-	-	2	1
CO-3	2	2	3	-	-	-	-	-	-	-	-	-	2	1
CO-4	2	2	3	-	-	-	-	-	-	-	-	-	2	1
CO-5	2	2	3	-	-	-	-	-	-	-	-	-	2	1

UNIT-I:

Introduction to IoT:

IoT terms and basic definitions, IoT vs M2M, Characteristics of IoT, IoT Eco-System, IoT applications and marketplace and IoT Reference Model.
Sensor and Actuators: Introduction to transducers, sensors and actuators, Sensor – classification and types, Actuators – Classification and types.

UNIT-II:

Embedded Platform for IoT: Embedded Platform brief introduction – Ardiuno and Raspberry Pi, RPI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT-III:
IoT Wireless Networks: Introduction to WSN and its architecture – Network topologies, Issues, Challenges and Security, WSN Technologies and its application - WiFi, Bluetooth, Zigbee, LoRa.

UNIT-IV:
IoT Protocol: Characteristics and Architecture of MQTT, XMP, DDS, AMQP, COAP and REST and their comparison

UNIT-V:
IoT Design Methodology: Process and requirement, Level Specification, Domain model and service specification, IoT application Development.
Case Studies Illustrating IoT Application: Home Automation – Smart Lighting, Home intrusion detection, Cities – Smart parking, Environment – Weather monitoring system, Weather reporting bot, Air pollution monitoring, Forest fire detection, Agriculture – Smart irrigation,

TEXT BOOKS:

1. Internet of Things, Srinivasa K. G., Siddesh G. M., Hanumantha Raju R., Cengage Publications, 2018
2. Internet of Things A Hands-on Approach, Arshdeep Bahga, Vijay Madisetti, Universities Press

REFERENCES:

1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand Stamatis Karnouskos, David Boyle, 1st Edition, Academic Press, 2014
2. Learning Internet of Things, Peter Waher, Packt Publishing
3. Architecting the Internet of Things, Bernd Scholz-Reiter, Florian Michahelles, Springer
4. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, Wiley

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PE1EC320) FUNDAMENTALS OF SIGNALS AND SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand various fundamental characteristics of signals and systems
- To study the importance of transform domain
- To analyze and design various systems
- To study the operations of convolution, correlation and the effects of sampling
- To understand Laplace and Z-transforms properties for the analysis of signals and systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Classify signals and systems based on their characteristics
CO-2: Apply various transform techniques to analyze continuous time and discrete time signals
CO-3: Identify the conditions for transmission of signals through systems and conditions for physical realization of systems
CO-4: Apply convolution and correlation functions for various applications
CO-5: Analyze the sampling process and effects of various sampling rates

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO-2	3	3	-	2	-	-	-	-	-	-	-	-	3	-
CO-3	3	2	-		-	-	-	-	-	-	-	-	3	-
CO-4	3	3	-	2	-	-	-	-	-	-	-	-	2	-
CO-5	3	3	-	2	-	-	-	-	-	-	-	-	2	-

UNIT-I:

Representation of Signals: Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, causal and non-causal signals, complex exponential and sinusoidal signals. Concepts of standard signals. Various operations on Signals.

Signal Analysis: Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Closed or complete set of orthogonal functions.

UNIT-II:

Fourier Series: Representation of Continuous time periodic signals using Fourier series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Inverse Fourier Transform, Introduction to Hilbert Transform.

UNIT-III:

Laplace Transforms: Laplace Transforms (L.T), Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of ROC, Properties of L.T, Inverse Laplace Transform.

Systems: Classification of Continuous time and discrete time Systems, impulse response, Transfer function, Response of a linear system, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT-IV:

Signal Transmission through Linear Systems: Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization.

Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

UNIT-V:

Sampling Theorem: Impulse Sampling- Graphical and analytical proof for sampling of Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Natural and Flat top Sampling, Discrete time processing of continuous time signals, Introduction to Band Pass Sampling.

Z–Transforms: Concepts of Z- Transform of a Discrete Sequence, ROC and it's properties, Properties of z-transforms. Inverse z-transform – Power series method, Residue Theorem method, Convolution method and Partial fraction expansion method.

TEXT BOOKS:

1. Signals, Systems and Communications, B. P. Lathi, BS Publications, 2009
2. Signals and Systems, Alan V.Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2nd Edition, PHI ,2000

REFERENCES:

1. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley, 1998
2. Signals, Systems and Transforms, C. L. Philips, J. M. Parr and Eve A. Riskin, 3rd Edition, PE,2004

3. Fundamentals of Signals & Systems, Michael Roberts, 2^{nd} Edition, Tata McGraw-Hill, 2010
4. Signals and Systems, H. P. Hsu, R. Ranjan, Scham's Outlines, Tate McGraw-Hill, 2006
5. Signals and Systems, A. Anand Kumar, 2^{nd} Edition, PHI, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PC1EC208) COMPUTER ORGANIZATION AND DESIGN

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Switching Theory and Logic Design

COURSE OBJECTIVES:
- To describe the functional blocks of a computer to interpret the instructions and various addressing modes for the execution of instruction cycle
- To perform Arithmetic micro-operations on integers and floating-point numbers
- To analyze the cost performance and design trade-offs in designing and constructing a computer processor including memory
- To discuss the different ways of communicating with I/O devices & interfaces and the design techniques to enhance the performance using pipelining, parallelism

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Interpret the functional architecture of computing systems and computer arithmetic
CO-2: Impart the knowledge on micro programming
CO-3: Explore the functionality of memories and control unit
CO-4: Understand I/O functions and analyze instruction level parallelism, concepts of advanced pipeline techniques

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	3	2	2	-	-	-	-	-	-	2	1
CO-2	3	2	1	1	-	-	-	-	-	-	-	-	2	1
CO-3	3	2	1	1	-	-	-	-	-	-	-	-	2	1
CO-4	3	2	2	3	2	2	-	-	-	-	-	-	2	1

UNIT-I:
Functional Blocks of a Computer: CPU, memory, input-output subsystem, control unit. Instruction set architecture of a CPU – registers of basic computer, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
Case study – Instruction set of some common CPUs.

UNIT-II:
Data Representation: Review of Signed number representation, fixed and floating-point representations, character representation.

Computer Arithmetic: Integer Addition and Subtraction - Ripple carry adder, carry look- ahead adder. Multiplication algorithms – Shift-and add, Booth multiplier, carry save multiplier. Division algorithms – Restoring and non-restoring techniques, floating point arithmetic.

UNIT-III:

Control Unit: Control memory, address sequencing, micro program example, and design of control unit, hardwired control, and micro programmed control.

UNIT-IV:

Memory Organization: Memory interleaving, concepts of hierarchical memory organization, Main memory, RAM and ROM chips, memory address map, Memory connection to CPU, Cache memory, hit ratio, cache size vs block size, mapping functions, replacement algorithms, write policies, virtual memory, Memory management hardware, secondary storage.
Semiconductor memory technologies, SRAM vs DRAM. ROM

UNIT-V:

Peripheral Devices and their Characteristics: Input-output subsystems, I/O device interface, I/O transfers, - program controlled, Interrupt driven and DMA, privileged and non –privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB.
Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction pipeline, RISC pipeline Vector Processing, Array Processors

TEXT BOOKS:

1. Computer System Architecture, M. Morris Mano, 3rd Edition, Pearson, 2007
2. Computer Organization and Embedded Systems, Carl Hamacher, 6th Edition, McGraw-Hill, 2011

REFERENCES:

1. Computer Organization and Design: The Hardware/Software Interfaces, David A. Patterson and John L. Hennessy, 5th Edition, Elsevier, 2012
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, WCB/McGraw-Hill, 2008
3. Computer Organization and Architecture: Designing for Performance, William Stallings, 10th Edition, Pearson Education, 2015
4. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan, 2nd Edition, Pearson Education, 2011

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PE1EC321) INTRODUCTION TO VLSI DESIGN

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic Electronic Devices and Circuits, Switching Theory and Logic Design

COURSE OBJECTIVES:

- To learn the fabrication process of Integrated Circuit and electrical properties of MOSFET
- To study the concepts of stick diagrams and layouts with the knowledge of MOS layers
- To understand the concept of scaling and its effects
- To learn the design of digital systems using subsystem design approach

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand IC Fabrication process steps required for various MOS circuits
CO-2: Know the various electrical properties of MOS transistors
CO-3: Design the digital circuits using various logic styles
CO-4: Implement subsystems with different technologies

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO-2	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO-3	2	3	2	-	-	-	-	-	-	-	-	-	3	2
CO-4	2	2	2	-	-	-	-	-	-	-	-	-	3	2

UNIT-I:

Introduction to MOS Technology: Introduction to Integrated Circuit Technology, The Integrated Circuit Era, MOS and Related Technology, Basic MOS Transistors, Operation of Enhancement and Depletion Mode Transistors, NMOS and PMOS Fabrication, CMOS Fabrication using P-Well, N-Well and Twin Tub processes.

UNIT-II:

Basic Electrical Properties of MOS and BiCMOS Circuits: Ids versus Vds relationships, MOS transistor threshold Voltage, Transconductance and Output conductance, Figure of Merit, NMOS inverter, Alternate forms of Pull-ups, pull-up to pull-down ratio for NMOS inverter driven by another NMOS inverter, pull-up to pull-down ratio for

NMOS inverter driven through one or more pass transistors, CMOS Inverter and its static characteristics, BiCMOS inverters

UNIT-III:

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams-NMOS and CMOS design styles, stick diagrams of NMOS and CMOS inverters, Lambda based design rules for NMOS and CMOS, Layout Diagram for NMOS and CMOS inverters. Scaling models and scaling factors, scaling factors for device parameters.

UNIT-IV:

Basic Circuit Concepts: Sheet Resistance and its concept applied to MOS transistors and inverters, Area Capacitance of layers and its calculations, delay unit, Inverter Delays, Wiring Capacitances, Choice of layers.

Combinational MOS Logic Circuits: Primitive CMOS logic gates –NOR & NAND gate, Realizing Boolean expressions using NMOS and CMOS gates, Stick diagrams of basic logic gates, CMOS full adder, Designing of logic circuits using Pass Transistor Logic(PTL) and CMOS transmission gates.

UNIT-V:

Subsystem Design: Parity generator, Multiplexer, Dynamic shift register, ALU subsystem, Serial-Parallel multiplier, Comparator, Up/Down Counter.

Trends in Technology Models: Introduction to CNTFET, FinFET and multi-gate FET, GNRFET.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems, Kamran Eshraghian, Dougles and A. Pucknell, PHI, 2005
2. CMOS Digital Integrated Circuits Analysis and Design, Sung-Mo Kang, Yusuf Leblebici, 3rd Edition, Tata McGraw-Hill, 2011

REFERENCES:

1. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E. Weste, David Harris, Ayan Banerjee, Pearson, 2009
2. Introduction to VLSI Systems: A Logic, Circuit and System Perspective, Ming-Bo Lin, CRC Press, 2011
3. Modern VLSI Design-IP-Based Design, Wayne Wolf,4th Edition, Prentice Hall, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PC2EE301) POWER ELECTRONICS LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Circuit Theory, Network Analysis, Electronic Devices and Circuits

COURSE OBJECTIVES:
- To design/develop suitable power converter for efficient control or conversion of power in drive applications
- To design / develop suitable power converter for efficient transmission and utilization of power in power system applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the operating principles of various power electronic converters
CO-2: Use power electronic simulation packages& hardware to develop the power converters
CO-3: Analyze and choose the appropriate converters for various applications

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	1	2	3	3	-	1	3	2	2	3	3
CO-2	3	2	3	1	2	3	3	-	2	3	2	2	3	2
CO-3	2	2	3	3	2	3	3	-	2	3	2	2	3	2

LIST OF PROGRAMS / EXPERIMENTS / EXERCISES:

1. Design and implement an analog firing circuit for SCR
    a) Analog Gate pulse generation for power electronics swithces
    b) Digital Gate Pulse generation for power electronic switches
    c) Modeling of power electronic switches like GaN, SiC using PSPICE
2. Gate drive circuits for MOSFET, IGBT
3. Single Phase fully controlled bridge converter with R and RL loads
4. DC-DC buck converter
5. DC-DC boost converter
6. Single Phase Bridge inverter with R and RL loads
7. Single Phase AC Voltage Controller with R and RL Loads
8. Single Phase Cyclo-converter with R and RL loads

9. a) Simulation of single-phase Semi converter using R and RL loads
   (b)Simulation of single-phase full converter using R, RL and RLE loads
10. Simulation of three-phase full converter using R, RL and RLE loads
11. (a)Simulation of DC-DC buck converter with design equations
    (b) Simulation of DC-DC boost converter with design equations.
12. (a)Simulation of single-phase Inverter with PWM control
    (b) Simulation of three phase Inverter with PWM control.

TEXT BOOKS:

1. Simulation of Electric and Electronic Circuits using PSPICE, M. H. Rashid, PHI
2. PSPICE A/D User's Manual, Microsim, USA
3. PSPICE Reference Guide, Microsim, USA
4. MATLAB and its Tool Box, User Manual, Mathworks, USA

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee03/preview
2. https://www.coursera.org/learn/power-electronics

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22PC2EE205) CONTROL SYSTEMS LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Control Systems

COURSE OBJECTIVES:

- To evaluate the effects of feedback on lab prototype systems
- To get the transfer functions of various physical and laboratory-based systems
- To design various controllers and compensators to improve system performance and test them in the laboratory

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Practically assess the performance of a system using time and frequency response techniques

CO-2: Use simulation tools to analyze systems from different stand points

CO-3: Obtain the transfer functions of lab prototype systems

CO-4: Design suitable controllers for the improvement of system Performance on simulated and real time systems

COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	2	3				1	1		1	3	2
CO-2	3	3	3		1		1		1		1		2	2
CO-3	3	3			3		1	3	1				3	1
CO-4	3	3	3	2	3	3	2	1	3	2	1	2	2	2

LIST OF PROGRAMS / EXPERIMENTS / EXERCISES:

1. Time response of second order system with different values of Damping Ratio
2. Effect of PID Controller on dynamic response of second order systems.
3. Design of lead compensator and its magnitude and phase plots.
4. Design of lag compensator and its magnitude and phase plots.
5. Transfer function of DC motor.
6. Effect of feedback on performance of DC servo motor.
7. Temperature control using PID Controller.
8. Simulation of PID controllers and its effects on system performance.
9. System analysis using Root locus and Bode plot through Simulation.

10. Root locus-based design of controllers for improving system performance through Simulation.
11. Frequency domain-based design of compensators for improving system stability through Simulation.
12. Time response of second order system with different values of Damping Ratio using simulation

TEXT BOOKS:

1. Control Systems Engineering, J. Nagrath and M. Gopal, New Age International, 2009
2. Modern Control Engineering, K. Ogata, Prentice Hall, 1991
3. Control systems Engineering, Norman S. Nise, Eighth edition, Wiley, 2019

REFERENCE:

1. Automatic Control System, B. C. Kuo, Prentice Hall, 1995

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106081/
2. https://nptel.ac.in/courses/108106098

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22MN6HS302) GENDER SENSITIZATION

TEACHING SCHEME		
L	T/P	C
2	0	0

EVALUATION SCHEME			
SE-I	SE-II	SEE	TOTAL
50	50	-	100

COURSE DESCRIPTION:

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programs combating gender-based violence and discrimination. The course also features a number of exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development

ACTIVITIES:

Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments

COURSE OBJECTIVES:

- To sensitize students on issues of gender in contemporary India
- To provide a critical perspective on the socialization of men and women
- To expose the students to debates on the politics and economics of work
- To enable students to reflect critically on gender violence
- To expose students to more egalitarian interactions between men and women

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand important issues related to gender in contemporary India

CO-2: Attain a finer grasp of how gender discrimination works in our society and how to counter it

CO-3: Acquire insight into the gendered division of labour and its relation to politics and economics

CO-4: Respond to put an end to gender violence

CO-5: Equipped to work with the other gender treating them as equals

MODULE 1: Introduction to Gender

- Definition of Gender
- Basic Gender Concepts and Terminology
- Exploring Attitudes towards Gender Social
- Construction of Gender

MODULE 2: Gender Roles and Relations

- Types of Gender Roles
- Gender Roles and Relationships Matrix
- Gender-based Division and Valuation of Labour

MODULE 3: Gender Development Issues

- Identifying Gender Issues
- Gender Sensitive Language
- Gender, Governance and Sustainable Development Gender and
- Human Rights
- Gender and Mainstreaming

MODULE 4: Gender-based Violence

- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

MODULE 5: Gender and Culture

- Gender and Film
- Gender and Electronic Media Gender
- Advertisement Gender
- Popular Literature
- Gender and the Structure of Knowledge
- Questions for Historians and Others, Reclaiming a Past, Writing Other Histories

TEXT BOOK:

1. Towards a World of Equals: A Bilingual Textbook on Gender, A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, Telugu Akademi, Telangana Government, 2015

REFERENCES:

1. More than One Million Women are Missing, Sen, Amartya, New York Review of Books 37.20 (20 December 1990), Print 'We Were Making History' Life Stories of Women in the Telangana People's Struggle, New Delhi: Kali for Women, 1989
2. By the Numbers: Where Indian Women Work, Women's Studies Journal (14 November 2012), Tripti Lahiri, Available online at: http: // blogs.wsj.com/ India real time/2012/11/14/by-the-numbers-where-India-women-work/&gt
3. I Fought For My Life and Won, Abdulali Sohaila, Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal
4. The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India, K. Kapadia, London: Zed Books, 2002
5. Just Development: Beyond Adjustment with a Human Face, T. Banuri and M. Mahmood, Karachi: Oxford University Press, 1997

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PC1EC321) MICROCONTROLLERS AND INTERFACING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Switching Theory and Logic Design

COURSE OBJECTIVES:
- To understand architectures of various microprocessors and microcontrollers
- To understand basic programming concepts and software development tools
- To learn interfacing techniques necessary for designing processor/ controller based real time systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the evolution and architectures of Microprocessors & Microcontrollers
CO-2: Understand the evolution and architectures of ARM processors
CO-3: Analyze and understand the instruction set and development tools of ARM
CO-4: Understand the exception, interrupts and interrupt handling schemes
CO-5: Understand the architecture and interfacing peripheral devices to ARM cortex M4 microcontroller

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	3	2										3	-
CO-2	2	2	2										3	-
CO-3	2	3	2										3	-
CO-4	2	2	2										3	-
CO-5	2	2	2										3	-

UNIT-I:
Introduction to Microprocessors and Microcontrollers: Evolution and introduction of 80X86 microprocessor, Architecture of 8086, Memory organization, Pin configuration. Overview of 8051 microcontroller, Architecture, Register organization, Interrupts, timer/ counter and serial communication.

UNIT-II:
Introduction to ARM Processors: Introduction to ARM processors, Evolution of ARM processors, pipeline organization, ARM Processor cores and CPU cores. Introduction

to ARM Cortex-M Processors, ARM Cortex-M4 processor's architecture, Programmer's model, Special registers, Operation Modes.

UNIT-III:

ARM Cortex-M4 programming: Assembly basics, Instruction set, Data transfer, Data processing, conditional and branch instructions, barrier and saturation operations, Cortex-M4-specific instructions, Thumb2 instructions, Keil Microcontroller Development Kit for ARM, Typical program compilation flow, Sample arithmetic and logical assembly language programs

UNIT-IV:

ARM Cortex-M4 Memory Systems and Interrupts: Overview of memory system features, Memory map, Memory access attributes and permissions, Data alignment and unaligned data access support, Bit-band operations, Overview of exceptions and interrupts, Exception types, Overview of interrupt management, Definitions of priority, Vector table and vector table relocation, Software interrupts, Exception Handling.

UNIT-V:

Cortex-M4 Implementation and Applications: Detailed block diagram, Bus interfaces on cortex-M4, External PPB interface, typical connections, reset types and signals. Getting started with µVision. Applications: Flashing of LEDS using Shift Register, Interfacing stepper motor, Interfacing temperature sensor, Interfacing ADC, Interfacing Real Time Clock, Interfacing of Analog Key pad

TEXT BOOKS:

1. Microprocessors and Interfacing, Douglas V. Hall, 2nd Edition, Tata McGraw-Hill, 1999
2. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors, Joseph Yiu, 3rd Edition, Newnes Publications, 2013

REFERENCES:

1. The 8051 Microcontroller and Embedded Systems, M. A. Mazidi, J. G. Mazidi, R. D. Mckinlay, 2nd Edition, Pearson 2007
2. The Definitive Guide to the ARM Cortex-M3, Joseph Yiu, 2nd Edition, Elsevier, 2010
3. ARM Assembly Language with Hardware Experiment, Ata Elahi-Trever Arjeski, Springer, 2015
4. ARM System on Chip Architecture, Steve Furber, Pearson Publications, 2000
5. ARM Assembly Language Fundamentals and Techniques, William Hohl and Christoper Hinds, 2nd Edition, CRC, 2015

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PC1EE304) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of Electrical and Electronics Engineering, Network Analysis, Electromagnetic Field Theory & Electrical Machines

COURSE OBJECTIVES:
- To introduce the basic concepts related to the operation of electrical and electronic measuring instruments
- To measure voltage, current, power, power factor, energy
- To measure unknown inductance, Resistance, capacitance using DC Bridges & AC Bridges
- To know the operation of DC potentiometers
- To introduce different transducers, sensors, and electronic measuring instruments

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the static characteristics, working of PMMC, MI, potentiometer, Dynamometer type, smart energy meter instruments
CO-2: Measurement of circuit parameters using AC and DC bridges
CO-3: Measurement using C.T, P.T. and calibration of meters using potentiometer
CO-4: Understand different electronic measuring instruments to use them more effectively

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	2	2	1	3	2	3	2	1	1	1	2	1
CO-2	3	3	2	2	1	3	2	3	2	1	1	1	2	1
CO-3	3	3	2	2	2	3	2	3	2	1	1	1	2	1
CO-4	3	3	2	2	3	3	2	3	2	1	1	1	2	1

UNIT-I:
Introduction to Measuring Instruments: Static characteristics of instruments- Accuracy, Precision, Linearity, Sensitivity, Dead time, Dead zone &Resolution. Types of errors, Random error analysis, Probable error, or tolerance
Classification of measuring Instruments, operating forces in measuring instruments & systems to provide Deflecting, Control and Damping Torques.

Measurement of Voltage and Current: PMMC, Moving Iron type instruments-Expression for the deflecting torque and control torque Extension of range using shunts and series resistance.

UNIT-II:

Measurement of Power, Power Factor and Energy: Dynamometer type instruments, construction, working principle, equation for deflection torque, Dynamometer type ammeter, voltmeter, and wattmeter (LPF & UPF), errors and compensation.
Smart Energy meter- Digital energy meter design components, circuit diagram, Digital meter software algorithm; meter working principle; Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI) environments.

UNIT-III:

Measurement of Resistance: Kelvins double bridge, V-A and A-V method, Wheatstone bridge, Loss of charge method and Megger.
Measurement of Inductance: Maxwell's inductance bridge, Maxwell's Inductance-Capacitance Bridge, Anderson's bridge, Hay's bridge.
Measurement of Capacitance: Desauty's bridge, Shearing bridge.

UNIT-IV:

Instrument Transformers and Potentiometers: Current and Potential transformers, ratio, and phase angle errors, turns compensation, measurement of power using instrument transformers.
Potentiometers: DC potentiometer, Standardization, Crompton DC potentiometer, Calibration of Voltmeters, Ammeters and UPF watt meter using D.C potentiometers.

UNIT-V:

Electronic Measurements: Digital voltmeters, CRO- Measurement of phase and frequency, Lissajous patterns, wave analysers, harmonic distortion analyser.
Instrumentation: Transducers, classification of transducers, strain gauge, LVDT, piezoelectric and Hall-effect transducers for displacement measurement, elementary treatment of thermistor, thermocouple and RTD, Smart sensors.
Data Acquisition Systems: Components of Analog data acquisition systems.

TEXT BOOKS:

1. Electrical and Electronics Measurements and Instrumentation, A. K. Sawhney, Dhanpat Rai & Co.
2. Modern Electronic instrumentation and Measurements Techniques, William D. Cooper, Albert D. Helfrick, Prentice Hall of India, 2002
3. Electrical and Electronics Measurements and Instrumentation, Prithwiraj Purkait, Budhaditya Biswas, Santanu Das, Chiranjib Koley, McGraw-Hill, 2013

REFERENCES:

1. Electrical Measurements and Measuring Instruments, E. W. Golding, F. C. Widdis, Reem Publications, 2011
2. Electronic Instrumentation and Measurements, H. S. Kalsi, 4th Edition, McGraw-Hill, 2019

3. Introduction to Measurements and Instrumentation, Arun K. Ghosh, 4th Edition, Eastern Economy Edition, PHI Learning, 2012
4. Electricity Metering in Easy Steps: An Outline Book on Smart Energy Meters for Everyone, Dr. Shashikant Bakre, 2015
5. Digital Metering System: A Better Alternative for Electromechanical Energy Meter in Nigeria, Ndinechi M. C., O. A. Ogungbenro, and K. C. Okafor, International Journal of Academic Research, 3.5, 2011, 189-192

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/108108076
2. https://nptel.ac.in/courses/108/105/108105153
3. https://www.cdac.in/index.aspx?id=pe_pe_PEG_SMARTENERGY

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22HS1MG301) PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Engineering Economics and Accounting

COURSE OBJECTIVES:
- To understand the principles, functions and theories of management and acquaint with the various theories of motivation and leadership styles
- To expose with a systematic and critical understanding of organizational theory, structures and design
- To comprehend the conceptual knowledge relating to organizational behaviour
- To explain how individual differences—such as personalities, perceptions, and organizational culture and climate affect employee performance
- To provide a basic understanding of the behaviour of individuals and groups in the organizations

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply theories to improve the practice of management and evaluate the appropriateness of various leadership styles, and motivational strategies used in a variety of organizational settings and evaluate their impact on employees
CO-2: Evaluate the basic design elements of organizational structure
CO-3: Analyse the behaviour of individuals and groups in organizations in terms of the key factors that influence organizational behaviour
CO-4: Assess several personality characteristics and perceive their influences on behaviour in the organisations
CO-5: Differentiate between team and group and determine the process of communication in the organisations

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using ***mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial****)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	-	-	-	-	-	-	-	-	2	1	3	1	-	-
CO-2	-	-	-	-	-	-	-	-	3	1	3	1	-	-
CO-3	-	-	-	-	-	-	-	-	3	1	3	1	-	-
CO-4	-	-	-	-	-	-	-	-	3	1	3	1	-	-
CO-5	-	-	-	-	-	-	-	-	3	1	3	1	-	-

UNIT-I:
Introduction to Management: Concepts of management - Nature, Importance, and Functions of management; Taylor's Scientific Management Theory; Fayol's Principles of Management; Social Responsibilities of Management; Motivation-Definition,

Theories: Maslow's need of Hierarchy, Herzberg two Factor, Mc Gregor Theory X and Theory Y; Leadership-Definition, Styles; Planning-definition and types of plans; Decision making-definition and process.

UNIT-II:

Organizing: Definition and Principles of Organization; Organization chart; Types of Mechanistic and Organic structures of organization - Line Organization, Line and Staff Organization, Functional Organization, Committee Organization, Matrix Organization, Virtual Organization, Cellular Organization, Team Structure, Boundaryless Organization, Inverted Pyramid Structure, and Lean and Flat Organization Structure-features and suitability.

UNIT-III:

Introduction to Organizational Behaviour: Organizational Behaviour- Definition; Historical Background; Nature, Scope and Importance; Linkages with other Social Sciences; Approaches- Human Resource, Contingency, Productivity and Systems approach; Models- Autocratic, Custodial, Supportive, Collegial and System Model.

UNIT-IV:

Perception: Definition; Factors influencing perception; Perceptual selectivity.

Personality: Definition; Determinants; Big Five Personality Model; Use of psychometric test.

Organizational Culture: Definition; Functions; Factors influencing.

Organizational Climate: Definition; Dimensions

UNIT-V:

Interpersonal Skills: Communication- Definition; Process; Channels; Interpersonal and Organizational and Barriers.

Teams and Groups: Definition; Types of teams and groups; Five-Stage Model; Characteristics of an effective teams; Transactional Analysis

Business Ethics: Ethics of Marketing and Advertising; Ethics of Finance and Accounting

TEXT BOOKS:

1. Essentials of Management, Harold Koontz, Heinz Weihrich, Mark V. Cannice, 11th Edition, Tata McGraw-Hill, 2020
2. Organizational Behaviour, Stephen P. Robbins, Timothy A. Judge, and Neharika Vohra, 18th Edition, Pearson Education, 2018
3. Organizational Behaviour, Fred Luthans, 12th Edition, McGraw-Hill, 2013

REFERENCES:

1. Management, James Arthur, Finch Stoner, R. Edward Freeman, and Daniel R. Gilbert, 6th Edition, Pearson Education/Prentice Hall, 2010
2. Organisational Behaviour, K. Aswathappa, 8th Edition, Himalaya Publications, 2021
3. Principles and Practices of Management and Organizational Behaviour, Chandrani Singh, Aditi Ktri, 1st Edition, Sage Publications, 2016

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PE1EE302) ELECTRIC DRIVES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Power Electronics, Electrical Machines – I, II & III

COURSE OBJECTIVES:
- To control DC motor with phase-controlled converters and choppers
- To control induction and synchronous motors with VSI and CSI
- To know braking concepts of DC & AC drives
- To get acquainted with special machine drives

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Implement four quadrant operation of DC motor using Phase controlled converter
CO-2: Analyze four quadrant operation of DC motor using choppers
CO-3: Evaluate various stator side control strategies of induction motor
CO-4: Asses rotor side control schemes of Induction motor
CO-5: Understand control of Synchronous and BLDC machines using Power electronic converters

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	3	2	1	2	1			2		1	2	3
CO-2	3	2	3	2	1	2	1	1			1	1	2	2
CO-3	3	3	2	2	2	2	1					1	2	3
CO-4	1	3	2	2	2	1	1		1			2	3	2
CO-5	2	2	2	2	3	1	2		1			2	3	1

UNIT-I:
Control of DC Drives by Phase Controlled Converters: Introduction to electric drives – Load torque components, Generalized multi quadrant operation, DC drive constant torque and constant power operation, Single phase and three phase semi and fully controlled converters connected to d.c separately excited motor – continuous current operation – Speed – Torque Characteristics-Problems. Regenerative braking – Problems. Single Phase Dual converter based four quadrant operations, Closed loop control of separately excited dc motor drive (Block diagram only).

UNIT-II:
Chopper-fed Separately Excited and Series DC Drives: Introduction to chopper-controlled DC drives - -Electric Braking – Plugging, Dynamic and Regenerative Braking

Operations-Analysis of single quadrant chopper drives -Two quadrant chopper drives- Four quadrant chopper drives- Continuous current operation– Speed torque characteristics- Problems.

UNIT-III:
Stator Side Control of Induction Motor Drive: Review of induction motor equivalent circuit and torque-speed characteristic, typical torque-speed curves of fan and pump loads,
V/f Control of Induction Motor: Steady-state performance analysis based on equivalent circuit, speed drop with loading, slip regulation. VSI, CSI fed induction motor, PW techniques - selective harmonic elimination, SPWM
Stator voltage control of Induction motor – AC Voltage controller, stator frequency control of induction motor – cyclo converters.

UNIT-IV:
Rotor side Control of Induction Motor Drive: Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, Performance of slip power recovery schemes.

UNIT-V:
Synchronous Motor Drives: Operation of self and separate -controlled synchronous motors by VSI and CSI- Closed Loop control operation of synchronous motor drives (Block Diagram Only)
Special Drives: Permanent magnet synchronous motor -Brushless DC motor – principle of operation- control of BLDC drives – square wave drive current regulation 180 degree and 120 degree switching strategies.

TEXT BOOKS:

1. Fundamentals of Electric Drives, G. K. Dubey, Alpha Science International, 2011
2. Drives and Control, Gnanavadivel, Electric AP Publishing House, 2013
3. Design of Brushless Permanent Magnet Motors, J. R. Hendershot, T. J. E. Miller, Magna Physics Publication & Oxford Press, 2010

REFERENCES:

1. Electric Motor Drives: Modeling, Analysis and Control, R. Krishnan, Prentice Hall, 2001
2. Modern Power Electronics and AC Drives, B. K. Bose, PHI

ONLINE RESOURCE:
1. Fundamentals of Electric Drives-“https://archive.nptel.ac.in/courses/108/104/108104140/”

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PE1EE303) SPECIAL MACHINES AND CONTROL

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Electrical Machines-I & II, Control Systems

COURSE OBJECTIVES:
- To learn the construction and applications of special electric machines
- To know the emerging trends in electrical machine topologies
- To appreciate the use of special electrical machines as control system components

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the construction and operational behavior of Stepping Motors
CO-2: Appreciate the usage of Reluctance Motors for suitable technical necessities to enhance the efficiency of the system
CO-3: Highlight credentials of Permanent Magnet Motors and judge the technical suitability
CO-4: Identify the emerging trends in novel electrical machine topologies like Axial and Transverse Flux Machines

COURSE ARTICULATION MATRIX:
*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	3	2	2	-	-	-	-	-	-	2	1
CO-2	3	2	1	1	-	-	-	-	-	-	-	-	2	1
CO-3	3	2	1	1	-	-	-	-	-	-	-	-	2	1
CO-4	3	2	2	3	2	2	-	-	-	-	-	-	2	1

UNIT-I:
Stepping Motors: Constructional features, principle of operation, modes of excitation, single phase stepping motors, torque production in variable Reluctance (VR) stepping motor, Dynamic characteristics, Drive systems and circuit for open loop control, Closed loop control of stepping motor, microprocessor based controller.

UNIT-II:
Reluctance Motors and Synchronous Reluctance Motors: Construction, axial and radial air gap Motors. Operating principle, reluctance torque–Phasor diagram, motor characteristics and linear induction motors.

Switched Reluctance Motors: Construction, principle, Torque equation, Power controllers, Characteristics and control. Microprocessor based controller. Sensor less control

UNIT-III:

Permanent Magnet Brushless DC Motors: Commutation in DC motors, Difference between mechanical and electronic commutators, Hall sensors, Optical sensors, Multiphase Brushless motor, Square wave permanent magnet brushless motor drives, Torque and emf equation, Torque-speed characteristics, Controllers- Microprocessor based controller. Sensor less control.

UNIT-IV:

Permanent Magnet Synchronous Motors: Principle of operation, EMF equation, power input and torque expressions, Phasor diagram, Power controllers, Torque speed characteristics, Self-control, Vector control, Current control schemes. Sensor less control.

UNIT-V:

Axial Flux Synchronous Machines: Principle of Operation- Construction, single air gap and multiple airgap axial flux machines, types sizing equations, torque equation, torque-speed characteristics, comparison between axial and radial flux machines, applications. Principle of Transverse Flux Machine (TFM).

TEXT BOOKS:

1. Special Electrical Machines, K. Venkataratnam, Universities Press
2. Design of Brushless Permanent Magnet Motors, J. R. Hendershot, T. J. E. Miller, Magna Physics Publication & Oxford Press, 2010
3. Stepping Motors – A Guide to Motor Theory and Practice, P. P. Aearnley, Peter Perengrinus, 1982

REFERENCES:

1. Stepping Motors and Their Microprocessor Controls, T. Kenjo, Clarendon Press, 1984
2. Permanent Magnet and Brushless DC Motors, T. Kenjo and S. Nagamori, Clarendon Press, 1988
3. Special Electrical Machines, E. G. Janardhan, PHI

ONLINE RESOURCE:

1. https://nptel.ac.in/courses/108102156

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PE1EE304) ENERGY STORAGE SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Circuit Theory, Chemistry for Engineers

COURSE OBJECTIVES:
- To design storage system for specific application
- To understand different battery modelling methods
- To compare different charging methods
- To understand battery state estimation techniques
- To appreciate importance of Battery Management Systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand storage requirements and storage related terminology
CO-2: Model Lio-ion batteries using different approaches
CO-3: Understand different Li-ion battery state estimation methods
CO-4: Evaluate suitable charging method based on state of battery and application
CO-5: Comprehend requirement and function of Battery Management System for Li-Ion battery

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	1	2	1	1	1	2	2	1	2	2	1	3	3	2
CO-2	3	3	3	2	2	3	1	1	2	1	1	1	3	3
CO-3	3	3	2	2	3	1	1	1	1	1	1	1	3	3
CO-4	1	3	2	2	2	1	2	1	1	1	1	2	2	2
CO-5	1	2	1	2	3	2	2	1	1	1	2	1	1	1

UNIT-I:
Storage Requirements: Introduction, Domains of application for energy storage-Review of storage requirements and storage mechanisms, Definitions and Measuring Methods-Terminology-Definitions of characteristics -States of batteries-Overview of electrochemical impedance spectroscopy, Practical Examples -House in isolated site-Currents in an operational electric car battery, recharging of batteries in electric cars-Numerical Examples

UNIT-II:
Performance Modelling of Lithium-Ion Batteries: Reaction Mechanism of Li-ion Batteries, Testing the Characteristics of Li-ion Batteries, Battery Modeling Methods-Equivalent Circuit Model-Electrochemical Model- Neural Network Model, Model Parameters Identification Principle, Implementation Steps of Parameter Identification, Comparison of Simulation of Three Equivalent Circuit Models, Battery modeling-Thevenin Model of Series Battery pack-Flow chart of simulation of series battery pack

UNIT-III:
Battery State Estimation: Definition of SOC-The Maximum Available Capacity-Definition of Single Cell SOC-Definition of the SOC of Series Batteries, Estimation of the SOC of a Battery-Load Voltage Detection- Electromotive Force Method-Resistance Method-Ampere-hour Counting Method-Kalman Filter Method-Neural Network Method-Adaptive Neuro-Fuzzy Inference System-Support Vector Mahines

UNIT-IV:
Charging Control Technologies for Lithium-Ion Batteries: Development of Charging Modes, Present Charging Methodologies-Demerits, Key Indicators for Measuring Charging Characteristics-Charge Capacity-Charging Efficiency-Charging Time, Charging External Characteristic Parameters, Analysis of Charging Polarization Voltage Characteristics-Calculation of Polarization Voltage-Analysis of Charging Polarization in the Time Domain-SOC Domain, Impact of Different SOCs and DODs, Improvements of the Constant Current and Constant Voltage(CCCV) Method

UNIT-V:
Battery Management Systems (BMS): Functions of BMS-Architecture of BMS, Design of Battery Parameters Measurement Module-Cell Voltage-Current -Total Voltage-Insulation- Measurement, Equalization Management Circuit-Energy Non-Dissipative Type-Energy Dissipative Type, Data Communication-CAN Communication-New Communication Mode, Logic and Safety Control-Power-Up Control-Charge Control-Temperature Control-Fault Alarm and Control, Testing the Stability of the BMS, Practical Example of BMS

TEXT BOOKS:

1. Fundamentals and Application of Lithium-Ion Battery Management in Electric Drive Vehicles, San Ping Jiang, Wiley, 2015
2. Lithium Batteries and Other Electrochemical Storage Systems, Christian Glaize, Sylvie Geniès, ISTE & John Wiley, 2013

REFERENCE:

1. Energy Storage Technologies and Applications, Ahmed Faheem Zobaa, InTech Publishers, 2013

ONLINE RESOURCE:

1. https://www.coursera.org/specializations/battery-technologies

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PE1EE305) SOFT COMPUTING TECHNIQUES IN ELECTRICAL ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To cater the knowledge of soft computing methodologies, such as artificial neural networks, fuzzy logic and genetic algorithms and applications to electrical systems
- To expose to the concepts of feed forward neural networks and about feedback neural networks
- To learn the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
- To understand about genetic algorithm, genetic operations and genetic mutations

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Comprehend and apply soft computing techniques and artificial neural networks for domain case studies

CO-2: Understand fuzzy logic, its design and applications

CO-3: Solve optimization problems using Genetic Algorithms and evolutionary algorithms

CO-4: Apply soft computing to solve problems in varieties of application domains

COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	2	-	3	2	3	-	-	-	-	1	3	2
CO-2	3	3	2	2	3	2	3	-	-	-	-	1	3	2
CO-3	3	2	2	-	3	2	3	-	-	-	-	1	3	2
CO-4	3	3	2	2	3	2	3	-	-	-	-	1	2	2

UNIT-I:

Introduction to Soft Computing: Concept of computing systems - "Soft" computing versus "Hard" computing - Classification of optimization problems- Unconstrained and Constrained optimization Optimality conditions- Introduction to intelligent systems- meta heuristic techniques- Characteristics of Soft computing - Some applications of Soft computing techniques, Max of Sin(x) Demonstration.

UNIT-II:

Introduction to Neural Networks: Introduction to Neural Networks, Models of Neuron Network, Architectures – Artificial intelligence and Neural Networks – Learning Process, Gradient Descent Training, Multi-layer perceptron using Back Propagation Algorithm (BPA)

UNIT-III:

Fuzzy Logic: Introduction –Fuzzy versus crisp –Fuzzy sets -Membership function –Basic Fuzzy set operations –Properties of Fuzzy sets –Fuzzy Cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers - Fuzzy Inference - Fuzzy Rule based system - Defuzzification methods.

UNIT-IV:

Genetic Algorithms: Introduction- Encoding – Fitness Function- Reproduction operators- Genetic Modeling Genetic operators – Crossover - Single – site crossover - Two point crossover – Multi point crossover - Uniform crossover – Matrix crossover - Crossover Rate Inversion & Deletion – Mutation operator – Mutation – Mutation Rate-Bit - wise operators - Generational cycle - convergence of Genetic Algorithm.

UNIT-V:

Applications of Soft Computing Techniques: Application for Electrical Systems : Maximation and Minimization of static functions - Speed and Position Control - Model estimation and prediction – Interpolation -Classification - Harmonic reduction - Controller Design - Optimization.

TEXT BOOKS:

1. Neural Networks, Fuzzy Logic & Genetic Algorithms, S. Rajasekaran and G. A. V. Pai, PHI, 2003
2. Neural Network & Fuzzy System, Bart Kosko, Prentice Hall, 1992

REFERENCES:

1. Neural Computing Theory & Practice, P. D. Wasserman, Van Nostrand Reinhold,1989
2. Fuzzy Sets, Uncertainty and Information, G. J. Klir and T. A. Folger, PHI,1994
3. Genetic Algorithms, D. E. Goldberg, Addison Wesley 1999

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PE1EE306) ADVANCED PROCESSES AND CONTROL

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Control Systems

COURSE OBJECTIVES:
- To introduce topics in advanced control systems as an extension to the control systems core course
- To learn PID tuning methods for SISO and MIMO systems used in industry
- To introduce Controller and observer design using State Space

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Design and tune PID controllers and Decouplers for SISO and MIMO systems
CO-2: Understand the nitty-gritties of multi-variable systems
CO-3: Recognize different state space representations and their significance
CO-4: Design controllers and observers using state space and understand the optimal control problem

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	2	-	3	2	3	-	-	-	-	-	3	2
CO-2	3	3	2	2	3	2	3	-	-	-	-	-	3	2
CO-3	3	2	2		3	2	3	-	-	-	-	-	3	2
CO-4	3	3	2	2	3	2	3	-	-	-	-	-	2	2

UNIT-I:
Tuning of PID Controllers: Review of P, PI, PID controllers. Feedback, Feedforward and Cascade control; Comparison. Ziegler Nichols and Cohen-Coon Methods for tuning PID controllers.

UNIT-II:
Multi-Variable Systems: Introduction to multivariable systems, SISO, MIMO Systems. Process interactions and control loop interactions. Pairing of controlled and manipulated Variables. Relative gain array, structure selection.

UNIT-III:

Controller Design for MIMO Systems: Decoupler design: Simple decoupler, static and Dynamic decouplers. PID controller design for MIMO systems: Detuning, Sequential loop tuning, independent loop and Relay auto-tuning methods.

UNIT-IV:

Fundamentals of State Space: State Space Representation for Linear and Non-linear Systems. Phase variable form, Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form, State diagram Representation, Stability analysis through state space.

UNIT-V:

Controller and Observer Design: Need for state feedback. Design of state feedback control through pole placement. Separation principle. Design of observer through pole placement method. Introduction to optimal control problem.

TEXT BOOKS:

1. Process Dynamics and Control, Dale E. Seborg, Thomas F. Edgar, D. A. Mellichamp, F. J. Doyle, 4^{th} Edition, John Wiley & Sons, 2016
2. Control Systems Engineering, J. Nagrath and M. Gopal, New Age International, 2009
3. Control systems Engineering, Norman S. Nise, 8^{th} Edition, Wiley, 2019

REFERENCES:

1. Modern Control Systems, Richard C. Dorf and Robert H. Bishop
2. Modern Control System Theory, M. Gopal, 2^{nd} Edition, New Age International, 1996

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PC2EE304) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Electrical Measurements and Instrumentation

COURSE OBJECTIVES:
- To calibrate P.F Meter, PMMC voltmeter, PMMC Ammeter using electro dynamo meter type instrument, DC potentiometer as the standard instruments
- To determine unknown inductance, resistance, capacitance by performing experiments on DC Bridges & AC Bridges
- To determine three phase active & reactive powers using wattmeter and instrument transformers practically
- To determine the ratio and phase angle errors of potential transformer
- To measure voltage, frequency, power factor with the help of DSO
- To measure physical parameters like displacement and temperature with the help of transducers

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Calculate the hysteresis loss of a given magnetic material
CO-2: Test, calibrate and choose instruments
CO-3: Find the unknown inductance, capacitance, and resistance by performing suitable experiment
CO-4: Measure displacement, temperature, and strain with the help of a suitable transducer

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	2	2	3	1	3	2	1	1	1	2	1
CO-2	3	3	3	2	2	3	1	3	2	1	1	1	2	1
CO-3	3	3	3	2	3	3	1	3	2	1	1	1	2	1
CO-4	3	3	3	2	3	3	1	3	2	1	1	1	2	1

LIST OF EXPERIMENTS:

1. Study and observe the oscilloscope as a test and measuring instrument. (Test the resistors, capacitors, diodes, transistors, measure AC/DC voltages, frequency, phase and study the Lissajous patterns).

2. Calibration of P.F meter by phantom loading.
3. Measurement of low resistance using Kelvin double bridge.
4. Measurement of inductance using Anderson bridge and Measurement of capacitance using Schering bridge.
5. Testing of Dielectric strength of transformer oil
6. Measurement of Three phase Active and Reactive power.
7. Measurement of Linear Displacement with the help of LVDT
8. Calibration of D.C voltmeter and Ammeter using DC potentiometer.
9. Measurement of % ratio error and phase angle of given P.T by Silsbee's method
10. Measurement of different ranges of temperatures using i) RTD ii) Thermocouple.
11. Measurement of Insulation resistance using Megger.
12. Measurement of strain using strain gauge.

TEXT BOOKS:

1. Electrical and Electronics Measurements and Instrumentation, A. K. Sawhney, Dhanpat Rai & Co.
2. Modern Electronic instrumentation and Measurements Techniques, William D. Cooper, Albert D. Helfrick, Prentice Hall of India, 2002
3. Electrical and Electronics Measurements and Instrumentation, Prithwiraj Purkait, Budhaditya Biswas, Santanu Das, Chiranjib Koley, McGraw-Hill Education, 2013

REFERENCES:

1. Electrical Measurements and Measuring Instruments, E. W. Golding, F. C. Widdis, Reem Publications, 2011
2. Electronic Instrumentation and Measurements, H. S. Kalsi, McGraw-Hill, 4th Edition, 2019
3. Introduction to Measurements and Instrumentation, Arun K. Ghosh, 4th Edition, Eastern Economy Edition, PHI Learning, 2012
4. Electricity Metering in Easy Steps: An Outline Book on Smart Energy Meters for Everyone, Dr. Shashikant Bakre, 2015
5. Digital Metering System: A Better Alternative for Electromechanical Energy Meter in Nigeria, Ndinechi M. C., O. A. Ogungbenro, and K. C. Okafor, International Journal of Academic Research, 3.5, 2011, 189-192

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/108108076
2. https://nptel.ac.in/courses/108/105/108105153
3. https://www.cdac.in/index.aspx?id=pe_pe_PEG_SMARTENERGY

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PC2EC321) MICROCONTROLLERS AND INTERFACING LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Switching Theory and Logic Design

COURSE OBJECTIVES:
- To describe the architectural features and instructions of 32-bit microcontroller Arm Controller
- To execute and Debug assembly language and C programs targeting Arm Controller
- To analyze the functions of various peripherals, peripheral registers of Arm Controller
- To apply the knowledge gained for Programming Arm Controller for different applications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Install, configure and utilize tool sets for developing applications based on ARM processor core
CO-2: write assembly language and C programs for various operations targeting Arm Controller
CO-3: Develop prototype codes using commonly available on and off chip peripherals on the Arm Controller
CO-4: Apply the knowledge of interfacing techniques to design controller-based systems

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	2	2						2	2			2	2
CO-2	2	2	2						2	2			2	2
CO-3	2	2	2						2	2			2	2
CO-4	2	2	2						2	2			2	2

LIST OF EXPERIMENTS:

PART A: Experiments using Keil Micro-vision
1. a) Write an ALP to multiply two 16-bit binary numbers.
   b) Write an ALP to find the sum of first 10 integer numbers.

c) Write an ALP to find factorial of a number.

d) Write an ALP to add an array of 16-bit numbers and store the 32-bit result in internal RAM

2. Write an ALP to find the square of a number (1 to 10) using look-up table.
3. a) Write an ALP to find the largest/smallest number in an array of 32 numbers.
   b) Write an ALP to arrange a series of 32-bit numbers in ascending/descending order.
4. Write an ALP to count the number of ones and zeros in two consecutive memory locations.
5. Write an ALP to Scan a series of 32-bit numbers to find how many are negative.

PART B: Experiments on ARM development boards

6. Blink an LED with software delay and delay generated using the SysTick timer.
7. Using the Internal PWM module of ARM controller generate PWM and vary its duty cycle.
8. Control an LED using switch by polling method and Interrupt method
9. Display "Hello World" message using Internal UART
10. Interface a 4x4 keyboard and display the key code on an LCD
11. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.
12. Interface a simple Switch and display its status through Relay, Buzzer and LED.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22HS2EN301) ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

INTRODUCTION:

Advanced English Communication Skills is an activity-based Practical/Lab course. With career readiness as its goal, students are trained in spoken and written communication to showcase their skills, articulate their goals, and highlight their contributions. The course helps students hone their LSRW skills, enhances their collaboration skills, equips them with strategies to present ideas effectively, craft compelling career documents, and communicate ethically and persuasively. Students will be provided with opportunities to deliver presentations and actively participate in group discussions. Mock interviews prepare them to handle challenging questions with poise and professionalism. The course aims to enable students to become confident and effective communicators

COURSE PRE-REQUISITES: A basic proficiency of Listening, Speaking, Reading, Writing (LSRW) Skills

COURSE OBJECTIVES:

- To equip students with the tools to cultivate self-awareness and develop professional communication skills through diverse strategies and training in verbal and non-verbal communication
- To enable students to create dynamic career documents and personal statements that effectively convey their skills and aspirations
- To strengthen student proficiency in academic writing and preparation of clear, concise reports adhering to standard conventions and ethical practices
- To train students to confidently utilize written, spoken, and visual communication tools for professional presentations and emails
- To help students enhance their ability to actively participate and effectively communicate in group discussions and interviews across various settings

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Deliver effective self-introductions tailored to varying professional contexts and audiences, demonstrating clarity, conciseness, and confidence

CO-2: Showcase strong employability skills by creating resumes, cover letters, and video resumes, and effective statements of purpose that convey their skills and aspirations besides highlighting personal and professional achievements

Co-3: Understand the need for adhering to academic ethics, apply paraphrasing skills to review relevant literature for academic writing, and prepare well-structured technical reports using effective writing strategies

CO-4: Compose professional emails adhering to proper etiquette, formatting, and tone, and make impactful presentations with clarity and confidence effectively using AV aids as required

CO-5: Actively engage in group discussions, demonstrating critical thinking, collaborative skills, and the ability to structure arguments, express opinions, and participate in mock interviews exhibiting quick thinking, clear communication, professionalism, and responsiveness to questions

COURSE ARTICULATION MATRIX:
(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	1	1	1	-	-	1	1	-	2	3	1	1	-	-
CO-2	1	2	1	1	1	2	1	-	1	3	1	2	1	1
CO-3	1	1	1	1	-	2	2	1	1	3	1	1	1	1
CO-4	1	1	1	1	1	2	2	1	2	3	2	2	1	1
CO-5	2	3	3	3	-	2	2	1	3	3	3	2	1	1

UNIT-I:
- Introducing Oneself in Professional Contexts
- Non-verbal Communication: Significance of non-verbal cues in communication; body language and its interpretation; proxemics and personal space; tone and vocal cues
- Story Telling Strategies for Communication
- SWOC Analysis for self-awareness and self-assessment

UNIT-II:
- Resume and Cover letter: Structure and Formats; Relevant keywords and
- action verbs; Writing a persuasive cover letter to complement the resume
- Video Resume: Tools and strategies
- Statement of Purpose (SOP): Purpose and significance in academic contexts; Key components and structure

UNIT-III:
- Paraphrasing - Purpose- avoiding plagiarism; Techniques for writing effective paraphrase; Awareness about Citation
- Technical Report Writing: Purpose and Significance; Structure of a Report- various sections- Course Project

UNIT-IV:
- E-correspondence - Significance, Purpose, and Structure of professional e-mails; Etiquette, tone, and formatting conventions; Writing clear and concise subject lines and messages.
- Presentations Skills - Structure, Organization of Ideas, Effective use of slides/audio-video

UNIT-V:
- Group Discussion: Types of GD, Conventions of formal GD; etiquette; organizing ideas; expressing opinions, agreeing and disagreeing; tips and strategies for successful discussions
- Interview Skills: Telephonic, Video Conferencing, and Face-to-Face

TEXT BOOKS:

1. Technical Writing Essentials, Suzan Last, University of Victoria, 2019
2. Technical Communication: A Practical Approach, William S. Pfeiffer, 7th Edition, Longman, 2012
3. Technical Communication: A Reader-Centered Approach, Anderson, Paul V. Reports In Paul V. Anderson's, 5th Edition, Heinle, 2003

REFERENCES:

1. Communication in the workplace: What can NC State Students Expect? Professional Writing Program, J. Swartz, S. Pigg, J. Larsen, J. Helo Gonzalez, R. De Haas, and E. Wagner, North Carolina State University, 2018 [Online] Available:https://docs.google.com/document/d/1pMpVbDRWIN6HssQQQ4MeQ6U-oB-sGUrtRswD7feuRB0/edit ↵
2. Technical Communication, Burnett Rebecca, 5th Edition, Heinle, 2001
3. Technical Writing Process and Product, Gerson Sharon J. and Steven Gerson, 3rd Edition, Prentice Hall 1999
4. Technical Communication: Situations and Strategies, Markel Mike, 8th Edition, 2006-2007
5. https://kupdf.net/download/learner-english-pdf-pdf_59beb5ec08bbc55c18686ee6_pdf

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22PW4EE301) INTERNSHIP

TEACHING SCHEME		
L	T/P	C
0	4	2

EVALUATION SCHEME		
CIE	SEE	TOTAL
-	100	100

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Gain exposure to the current technological developments relevant to the subject area of training
CO-2: Apply the technical knowledge in real industrial situations
CO-3: Promote academic, professional and/or personal development
CO-4: Demonstrate effective communication skills through oral presentation
CO-5: Engage in effective written communication through internship report

COURSE OUTLINE:

- A student shall undergo an internship at a reputed industry/research organization/academic institution.
- Student shall register for this course immediately after IV semester (II year II semester) End Examinations and pursue it during summer vacation/semester break & during III year without affecting the regular course work.
- Evaluation shall be done by a committee consisting of an external examiner, Head of the Department, internal supervisor and a senior faculty member of the department.
- A student shall submit a detailed report and present it before the committee for evaluation.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22MN6HS301) ANCIENT WISDOM

TEACHING SCHEME		
L	T/P	C
2	0	0

EVALUATION SCHEME			
SE-I	SE-II	SEE	TOTAL
50	50	-	100

COURSE OBJECTIVES:

- To provide students a fundamental understanding of ancient wisdom from various world civilizations and its relevance to STEAM fields about certain aspects of culture, heritage, and history as sources of knowledge and application for the present and future
- To explore the historical context and contributions of ancient Indian and other global civilizations to STEAM disciplines and to foster scientific temperament using the approaches that stood the tests of time
- To help students develop critical thinking and logical reasoning by understanding ancient texts, philosophies, and practices, and by exploring their applicability for responsible consumption and sustainable development
- To help students create a karmic, sustainable, humane, and responsible future for the world with scientific temperament and a sense of belongingness and ownership to our heritage as humans

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Describe important contributions of ancient Indian and other world civilisations to STEM disciplines, fostering a scientific temperament
CO-2: Conceptually analyse ancient texts and philosophies to identify aspects of sociocultural relevance to the present day with a focus on sustainable development
CO-3: Apply principles, concepts, approaches, and ideas of ancient wisdom to improve human life/ society through STEM professional activities and management
CO-4: Know the importance of learning from the past and developing systems thinking to look at the big picture, leading to interdependence that promotes interdisciplinary approaches to holistic development and ethical future

ACTIVITIES: Dialogue-based lectures, Videos, Debates and discussions, collaborative learning activities and group work including presentations and posters

MODULE 1:
Introduction and Motivation
Introduction: How ancient is ancient? Is all ancient wisdom fundamentally religious or spiritual? Does ancient wisdom still have anything important to remember and consider relevant today? Why should we look back while living in the present and building for the future? How can we separate religion, spirituality and philosophy?
The Indian Story: Was India really a great country in the past? What has changed in India since, and what has not? How is culture and heritage important or relevant for the future that is not like the past at all? Was knowledge really codified in literature? Is

Hinduism a way of life or a religion and should we care? Is the caste system or varna system divisive?

History of Sciences and History of Arts: What has humanity achieved so far in Sciences and in Arts? Understanding the geography of thought and pursuit of knowledge; Leading from the emerging future through the history of humanity

Definitions and classifications: Eastern, Arabic, and Western philosophical approaches; Epistemology, Phenomenology, Hermeneutics, Metaphysics, tarka, nyäya, mïmämsa, ikigai, oubaitori, eudaimonia, gestell

MODULE 2:

Deep Dive into the India Story

Ancient India: Indian Ethos, Concepts of dharma, karma, chaturvidha purushaartha (dharma, artha, käma, moksha), triguna (sattva, rajas, tamas) – relevance and interpretation for contemporary living; Major Indian contributions: To Education, Language, Governance, and Academic Disciplines with particular focus on STEAM (STEM and Arts)

Documented and Undocumented Knowledge: Vedas, Vedangas, Upanishats, Epics and Mythology: Ramayana, Mahabharata and Bhagavad-Gita, Puranas including Bhagavata; Examples of codified knowledge from various written verses: did they actually mean what we now interpret them to be?

Medieval India: Advancements and developments in education, governance, technology, and society

Modern India: Constitutional values of India influenced by Ancient and Medieval Indian history and culture

Summary of Values in Indian Ethos: Family system, the karma principle and the idea of nishkaama karma, practising and swadharma, protecting dharma, Endurance and Patience (sahanam), Motivation and Determination (sankalpam), Attention and Devotion (Sraddha), Industriousness and Exertion (Srama), Understanding the Self and Ego, Peace (Saanti), Proactive non-violence (ahimsa), Empathy, Altruism, Focus on the big picture, Inquisitiveness and Pursuit of Knowledge, Harmony, Oneness of Humanity (vasudhaika kutumbam), Learning from the Nature and concern towards other lifeforms

Looking beyond the "proud claims": Myths and facts about Indian ancient wisdom: Pursuing Truth, in the Indian way; Can India be the "Viswa Guru"? If yes, how? If not, can/shall we still work towards it?

MODULE 3:

Ancient Civilisations and Wisdom from other parts of the World

Overview: Indus Valley and other ancient cultures of the Indian subcontinent – their influence on Southeast Asia; Civilisations outside of Indian subcontinent: Mesopotamian, Egyptian, Far East, European, Middle East and African, North, Central and South American, Oceanic cultures and their indigenous peoples

Advancements of the Ancient World: Advances in governance, arts, medicine and health, architecture, metallurgy, weaponsmithy, mechanisation, cosmology, other science and technology, mathematics, astronomy, language, trade and travel, philosophy, other cultural aspects

Sources of Wisdom, Religion, and Spirituality: Overview of major Abrahamic religions and their holy books: The Holy Qur'an, Hadith, and Sharia for Islam; The Old and New

Testaments for Christians; Overview of other world religions and their tenets; Overview of Ancient Greek and Ancient Chinese philosophies; Philosophies of Abrahamic religions and non-Abrahamic religions of Indian origin

MODULE 4: Applicability of Ancient Wisdom
Understanding limitations of ancient wisdom; Examining ancient wisdom to find logical relevance and applicability to the present world; Applying tarka Sästra principles—dialectics, debates, analyses, discussions—and understanding the spirit of scholars of tarka Sästra, such as Adi Sankara, Aristotle, Ramanuja, Plato; Identifying core principles, approaches, and ideologies in formulation, design, strategy, and execution in various STEAM domains

MODULE 5: Lessons to Learn from Ancient Wisdom
Understanding Bhagavad Gita as a text of introspection and motivation, for personality development, team management, and organisational excellence; Exploring ancient books for strategy and management: The Art of War (Sun Tzu), Artha Sastra (Kautilya), parts of ämukta mälyada (Krishna Deva Raya) and Mahabharata (Vyasa/ Tikkana)
The Way Forward: Developing a systems thinking approach; Developing a humanitarian and scientific temperament based on cultural and constitutional values; Leveraging education to resolve societal problems and creating impact with focus on responsible consumption and sustainable development; reinstalling "human" at the centre of development and using technology for enablement instead of enslaving; Understanding the value of interdependence and Presencing

TEXT BOOKS:
1. The Wonder That Was India: Volume I, A. L. Basham, Picador India, 2019 (ISBN: 978-9389109344)
2. Indian Science and Technology in the Eighteenth Century, Dharampal, Rashtrotthana Sahitya, 2021 (ISBN: 978-8175310933)
3. A History of Science in World Cultures: Voices of Knowledge, Scott L. Montgomery and Alok Kumar, Routledge, 2015 (ISBN: 978-0415639842)
4. Sapiens: A Brief History of Humankind, Harper, Yuval Noah Harari, 2015 (ISBN: 978-0099590088)
5. Think on These Things, Jiddu Krishnamurti, Jaico Publishing House, 2024 (ISBN: 978-8119153794)

REFERENCES:
1. The Geography of Thought: How Asians and Westerners Think Differently and Why, Richard E. Nisbett, Nicholas Brealey Publishing, 2004 (ISBN: 978-1529309416)
2. The Question Concerning Technology, and Other Essays, Martin Heidegger, Harper Perennial Modern Classics, 2013 (ISBN: 978-0062290700)
3. Arise Awake & Don't Stop!, Swami Vivekananda, Namaskar Books, 2022 (ISBN: 978-9355717221)
4. The Hindu Way: An Introduction to Hinduism, Shashi Tharoor, Aleph Book Company, 2019 (ISBN: 978-9388292856)
5. Eastern Religions and Western Thought, Sarvepalli Radhakrishnan, Oxford University Press, 1997 (ISBN: 978-0195624564)

OPEN ELECTIVE TRACKS

OE TRACKS BASED ON MEZZANINE TECHNOLOGIES:

OE TRACKS (Parent Department)	V SEMESTER	VI SEMESTER	VII SEMESTER	VIII SEMESTER
Smart Cities (CE)	Smart Cities Planning and Development **(22OE1CE301)**	Green Building Technology **(22OE1CE302)**	Smart Materials and Structures **(22OE1CE401)**	Intelligent Transportation System **(22OE1CE402)**
Waste Management (CE)	Solid Waste Management **(22OE1CE303)**	Hazardous waste management **(22OE1CE304)**	Waste to Energy **(22OE1CE403)**	Intelligent Waste Management and Recycling System **(22OE1CE404)**
Green Energy (EEE)	Renewable Energy sources **(22OE1EE301)**	Renewable Energy Technologies **(22OE1EE302)**	Energy Storage Technologies **(22OE1EE401)**	Energy Management and Conservation **(22OE1EE402)**
3D Printing & Design (ME)	Elements of CAD **(22OE1ME301)**	Introduction to 3D Printing **(22OE1ME302)**	3D Printing - Tooling and Systems **(22OE1ME401)**	Reverse Engineering **(22OE1ME402)**
Internet of Things (ECE)	Sensors Transducers and Actuators **(22OE1EC301)**	Introduction to Microcontrollers and Interfacing **(22OE1EC302)**	Fundamentals of Internet of Things **(22OE1EC401)**	Wireless Sensor Networks **(22OE1EC402)**
Augmented Reality (AR) / Virtual Reality (VR) (ECE)	Introduction to Signal Processing **(22OE1EC303)**	Introduction to Image and Video Processing **(22OE1EC304)**	Fundamentals of Augmented Reality and Virtual Reality **(22OE1EC403)**	Introduction to Metaverse **(22OE1EC404)**
Microelectronics (ECE)	Principles of Microelectronics **(22OE1EC305)**	Programmable Logic Devices for Microelectronics **(22OE1EC306)**	Fundamentals of Physical Design for VLSI **(22OE1EC405)**	Recent Trends in Microelectronics **(22OE1EC406)**
Artificial Intelligence (CSE)	Applied Mathematics in Artificial Intelligence **(22OE1MT301) /** Mathematics for Artificial Intelligence **(22OE1MT302)**	Fundamentals of Artificial Intelligence **(22OE1CS303)**	Machine Learning Techniques **(22OE1CS401)**	Deep Learning **(22OE1CS402)**
Blockchain Technologies (CSE)	Fundamentals of Computer Networks **(22OE1CS301)** / Relational Data Base Management Systems **(22OE1CS302)**	Cryptography and Network Security **(22OE1IT301)**	Distributed Data Bases **(22OE1CS403)**	Blockchain Technology **(22OE1CS404)**
Robotics (EIE)	Fundamentals of Robotics **(22OE1EI301)**	Kinematics of Robots **(22OE1EI302)**	Drive Systems for Robots **(22OE1EI401)**	Intelligent Systems for Robots **(22OE1EI402)**
Cyber Security (IT)	Fundamentals of Computer Networks **(22OE1CS301)** / Relational Data Base Management Systems **(22OE1CS302)**	Cryptography and Network Security **(22OE1IT301)**	Essentials of Cyber Security **(22OE1IT401)**	Computer Forensics **(22OE1IT402)**
Data Sciences / Big Data & Analytics (IT)	Statistical Methods for Data Science **(22OE1MT303)**	Computational Thinking using Python **(22OE1IT302)**	Fundamentals of Data Mining **(22OE1IT403)**	Data Analysis and Visualization **(22OE1IT404)**

Autonomous Vehicles (AME)	Principles of Automobile Engineering **(22OE1AE301)**	Modern Automotive Technologies **(22OE1AE302)**	Electric, Hybrid and Fuel Cell Vehicles **(22OE1AE401)**	Connected and Autonomous Vehicles **(22OE1AE402)**

GENERAL POOL OF OE COURSES:

OE TRACKS (Parent Departments)	COURSES
General-Computing (CSE / IT)	• Programming Through JAVA **(22OE1IT303)** • Relational Data Base Management Systems **(22OE1CS302)** • Computational Thinking using Python **(22OE1IT302)** • Introduction to Data Analytics **(22OE1IT304)** • Fundamentals of Computer Algorithms **(22OE1CS305)** • Introduction to Front End Technologies **(22OE1CS306)** • Generative AI **(22OE1CS307)**
General (H&S)	• Professional Ethics and Human Values **(22OE1HS301)** • Entrepreneurship **(22OE1HS302)** • Personality Development and Public Speaking • Foreign Language-French **(22OE1HS402)**
General	• Smart Cities **(22OE1CE305)** • Trends in Energy Sources for Sustainable Development **(22OE1EE303)** • 3D Printing and Design **(22OE1ME303)** • Advanced Materials **(22OE1ME304)** • 5G/6G Technologies **(22OE1EC307)** • Fundamentals of VLSI **(22OE1EC308)** • AI for Beginners **(22OE1CS304)** • Blockchain Technology Essentials **(22OE1CS309)** • Fundamentals of Robotics and Drones **(22OE1EI303)** • Introduction to Cloud Computing **(22OE1IT305)** • Fundamentals of Computer Vision **(22OE1IT306)** • Introduction to Advanced Vehicle Technologies **(22OE1AE303)** • Introduction to Application Development with C# **(22OE1CS310)** • Introduction to Application Development with Java **(22OE1CS311)** • Introduction to Application Development with Python **(22OE1CS312)** • Nanoscience and Technology for Engineers **(22OE1PH301)** • Essentials For Quantum Computing **(22OE1PH302)** • Introduction to Climate Change **(22OE1CH301)** • Sustainable Chemistry for Engineering **(22OE1CH302)** • Storytelling For Effective Communication **(22OE1ENH301)** • Film Analysis and Critical Appreciation **(22OE1EN302)** • Creative Writing **(22OE1EN303)** • Cross-Cultural Communication Through World Literature **(22OE1EN401)** • Business Communication **(22OE1EN402)** • Fundamentals of Management **(22OE1MG301)** • Personal Finance and Tax Planning **(22OE1MG302)** • Corporate Finance **(22OE1MG303)** • Cost And Management Accountancy **(22OE1MG304)** • Human Resource Management **(22OE1MG305)** • Marketing Management **(22OE1MG306)** • Numerical Analysis and Linear Programming **(22OE1MT304)** • Optimization Techniques **(22OE1MT305)**

SMART CITIES

Offered by: **CIVIL ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Smart Cities	Smart Cities Planning and Development	Green Building Technology	Smart Materials and Structures	Intelligent Transportation System

SMART CITIES

In the twenty-first century, engineers are being tasked with solving ever more complex and subtle societal challenges – from climate change to unprecedented urbanisation that is materially affecting the lives of many urban populations. As engineers become ever more interdisciplinary and the boundaries of disciplines soften, they need to reflect as a community as to the appropriateness of the engineering paradigm to address these needs. Currently the engineering community is pointing to the digital technologies and the 'smart city' as a deliverer of efficiency and resilience without fully acknowledging the intricate socio-political context in which it is situated.

The domain of EIE was developed to modernise and automate these operations using the technological advancements in the realm of electronics. Even outside the industry, common household appliances — such as washing machine, air-conditioner, geyser, and microwave oven — cannot attract customers without features such as auto cut-off after certain time or temperature, which is again an example of instrumentation. The field of Instrumentation Engineering is also core to the recent advances such as smart home appliances, smart cities and automobiles. It is thus not far from the truth to claim that the fourth industrial revolution.

The world population is continuously growing and reached a significant evolution of the society, where the number of people living in cities surpassed the number of people in rural areas. This puts national and local governments under pressure because the limited resources, such as water, electricity, and transports, must thus be optimized to cover the needs of the citizens. Therefore, different tools, from sensors to processes, service, and artificial intelligence, are used to coordinate the usage of infrastructures and assets of the cities to build the so-called smart cities.

Different definitions and theoretical models of smart cities are given in literature. However, smart city can usually be modelled by a layered architecture, where communication and networking layer plays a central role. In fact, smart city applications lay on collecting field data from different infrastructures and assets, processing these data, taking some intelligent control actions, and sharing information in a secure way. Thus, a two-way reliable communications layer is the basis of smart cities. This chapter introduces the basic concepts of this field and focuses on the role of communication technologies in smart cities. Potential technologies for smart cities are discussed, especially the recent wireless technologies adapted to smart city requirements.

What is the concept of a smart city?

There is no universally accepted definition for a smart city because people can interpret different meanings for it. Hence, it means different things to different people. Here, you will get a basic definition that captures the essence of what a smart city is and what it does. While the concept varies from area to area depending on the resources, the basic idea behind it remains the same. A smart city aims to bring various components together to live harmoniously and attempts to do with the least environmental damage or impact. In other words, a smart city is a place with high standards of living, which survives and thrives on eco-friendly means. The size and amenities within a smart city vary according to geography, resources available, geopolitical scenario and investment received.

Growth in Global population continues to drive citizens from rural areas to cities. With rapid expansion of urban areas, cities need to become intelligent to handle this large scale urbanization. This is driving city operators to look at smarter ways to manage complexities, increase efficiencies and improve quality of life. Today we need cities that monitor& integrate infrastructure to better optimize resources while maximizing service to its citizens. So to meet all the needs we need our cities to be smarter which brings a concept "**Smart cities**" Smart cities optimize the use of technology in the design & operation of infrastructure and buildings in such a way which meets the current and future needs of their citizens. To be truly smart they also require consideration of governance &growth, urban development and infrastructure, the environment & natural resources, society and community.

Smart city programs provide a range of technologies that can be applied to solve infrastructure problems associated with ageing infrastructure and increasing demands. The potential for infrastructure and urban improvement remains unrealized, however, due to technical, financial, and social constraints and criticisms that limit the implementation of smart cities concepts for infrastructure management. The discussion presented here provides a review of smart technologies including sensors, crowdsourcing and citizen science, actuators, data transmission, Internet of Things, big data analytics, data visualization, and blockchain, which can be used for infrastructure management. Smart infrastructure programs are reviewed to explore how enabling technologies have been applied across civil engineering domains, including transportation systems, water systems, air quality, energy infrastructure, solid waste management, construction engineering and management, structures, and geotechnical systems.

Making cities "smarter" by efficient management of resources and infrastructure, greener environment, and smart governance resulting in a better quality of living of its citizens. This can be enabled by the effective use of information and communication technologies (ICTs) tools, which have the ability to provide eco-friendly and economically viable solutions for cities.

Setting up a smart city is more than improving the old system with technology by simply adding sensors, remote supervision, and control to essential city services. It should be a complete shift of a paradigm in daily life when using new technologies, especially new ICT leading to smart outcomes.

Smart solutions

Another important feature of smart cities is that they will provide smart solutions to modern problems. These include:

- Public information systems
- Redressal of grievances
- Electronic service delivery
- Maximum engagement of citizens
- Reduced energy and fuel usage
- Reduces the development of wastes
- Smart water monitoring
- Treatment of wastewater
- Sustainable monitoring water quality

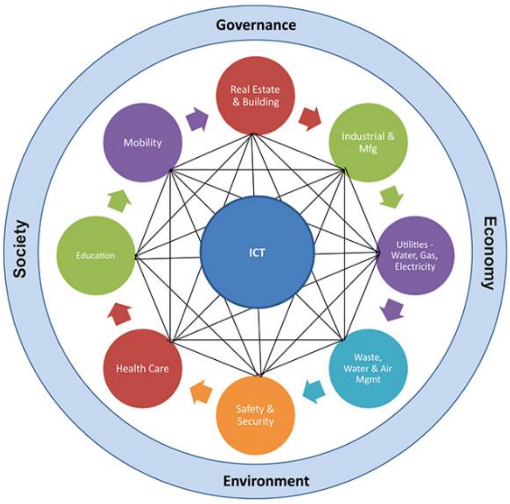
- Maximum utilization of renewable energy sources
- Usage of green building techniques
- Smart parking to reduce clutter
- Intelligent traffic management system.

Advantages of a smart cities,

1. Promotion of mixed land usage resulting in higher efficiency and reduced wastage of land.
2. Expanded housing opportunities.
3. Reduced congestion, air pollution and resource depletion.
4. Helps to boost local economies by promoting localized trade and interactions.
5. Efficient use of public transport to reduce fuel wastage.
6. Safe and secure localities.
7. Preservation of open spaces.
8. Reduction in urban heating.
9. Promotion of transit-oriented development.
10. Making governance more people-friendly and cost-effective.

Here's a look at some projects that have taken inspiration from the concepts used for the design of smart cities. These projects will help you build energy-efficient systems that will help heal the world.

1. **Home Automation using IoT**
2. **Smart Irrigation System**
3. **Smart Building using IoT**
4. **Smart Energy Meter using GSM**
5. **Solar and Smart Energy Systems**
6. **Smart Water Monitoring**
7. **Automated Street Lighting**
8. **Automated Railway Crossing**
9. **Intelligent Transportation Systems**
10. **Smart Sewage Maintenance Systems.**



To develop new smart cities and to transform our cities into smart cities the engineers in particular are stepping up as leaders.

Civil & Environmental Engineers are working to harness the potential of latest technologies and data for our urban infrastructure, which is among the most complex system in the world. They provide sustainable, resilient and advanced means of transportation system, green building, better water management system and better waste management system. This not only develop physical infrastructure but also develop institutional & social infrastructure that enable our societies to function. Modelling these systems of systems will require managing data at an unprecedented scale.

To support them Computer and **Electronics & Communication Engineers** help in creating future cities that are digital, build and operate cities ICT landscape across application and infrastructure like IOT (Internet of Things), e-payment, e-market, the latest communication devices etc which is leveraging next generation technologies.

They create a platform for conveyance of different city services, leverage big data analytics to manage city performance and proactive crisis management.

Electrical Engineers developing new renewable source of energy to meet ever increasing power demands. They also develop methods of effective power transmission with minimum losses which is more economical and safer. They also work on developing microchips to micro sensors which are helping in making our households, institution efficient and safer.

Conclusion

It is clear that dreaming of a smart city without active contribution of engineers is a myth. So, there will always be demand of Engineers and because of which even after crises in the placement scenario still the maximum science students choose Engineering as their first career choice in hope of a better future.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CE301) SMART CITIES PLANNING AND DEVELOPMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To Introduce smart city basic concepts, global standards and Indian context of smart cities
- To understand smart community, smart transportation and smart buildings
- To understand energy demand, green approach to meet energy demand and their capacities
- To identify smart transportation technologies in cities and concepts towards smart city

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Recognize smart city concepts and their international and national standards
CO-2: Recognize smart community, transportation and building concepts
CO-3: Develop and calibrate energy demand and their capacity limits
CO-4: Predict the various smart urban transportation systems and the transition from existing city towards a smart city

UNIT-I:
Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart Cities – Global Standards and Performance Benchmarks, Practice Codes - Indian scenario - India “100 Smart Cities” Policy and Mission.

UNIT-II:
Smart Cities Planning and Development: Introduction to Smart Community - Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water – Cyber Security, Safety, and Privacy - Internet of Things, Blockchain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT-III:
Smart Urban Energy Systems: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – A statistical analysis -Meeting energy demand through direct and indirect solar resources, Effectiveness in responsive environment in smart city; Smart communication using green resources, Introduction to PV technology- Policies of Solar PV in smart domains - Smart Grid- Indian Perspective- Advantage & limitation.

UNIT-IV:

Smart Urban Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - Ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

UNIT-V:

Towards Smart Cities: The transition of legacy cities to Smart -. Right transition process- The benefit of citizens, cities to adopt effective management and governance approaches - Factors in the transition phase of legacy cities to smart cities and their managerial implications.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanaga Chidambaresan, R. Maheswar, V. Manikandan, K. Ramakrishnan, Springer, 2020
2. Society 5.0: A People-centric Super-smart Society, Hitachi-U, Tokyo Laboratory (H-U Tokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCES:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity Yu-min Joo, Yu-Min Joo, Teck-Boon Tan, Edward Elgar Pub, 2020
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier, 2020

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1CE302) GREEN BUILDING TECHNOLOGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Smart Cities Planning and Development

COURSE OBJECTIVES:

- To expose to green buildings, their features and importance in the present context of sustainable development
- To introduce various sustainable building materials for green buildings
- To acquire knowledge on various design concepts and construction aspects of green buildings
- To learn the various policies and incentives for green buildings and also different green building rating systems and codes

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the importance, features and requisites of a green building
CO-2: Identify suitable sustainable building materials for construction of green building
CO-3: Apply the fundamental knowledge on design and construction techniques for green buildings
CO-4: Implement the acquired knowledge of policies and rating systems for green buildings

UNIT-I:
Introduction to Green Buildings: Sustainable Development - Definition and Importance – United Nations Sustainable Development Goals (UN SDG's) - Definition of green buildings - Typical features of green buildings - Benefits of green buildings - Key requisites for constructing green buildings - Important sustainable features for green buildings - Climate responsive buildings - Carbon footprint and Eco footprints of buildings.

UNIT-II:
Green Building Materials: Introduction to sustainable building materials - Sustainable concrete - Partial replacements in concrete - Use of industrial waste such as fly-ash, GGBS, silica fume, rice husk ash, construction & demolition waste - Natural building materials - Bio materials - Mycelium - Engineered wood - Structural Insulated Panels (SIPs) - Natural fiber – Non-toxic materials: low VOC paints, organic paints, coating and adhesives - Use of waste materials such as paper, cellulose, glass bottles, tires, shipping containers.

UNIT-III:
Design of Green Buildings: Indoor environmental quality requirement and management: Thermal comfort - HVAC - Visual perception - Illumination requirement

- Auditory requirement - Energy Efficiency - Lighting and day lighting - Steady and non-steady heat transfer through the glazed window and the wall - Indoor air quality - Local climatic conditions - temperature, humidity, wind speed and direction.

UNIT-IV:

Construction of Green Buildings: IoT integrated automated building systems - Synthetic roof underlayment - Green roofs - Grid hybrid system - Passive solar - Greywater plumbing systems - Electrochromic glass - Solar thermal cladding - Structural 3D printing - Self-healing concrete - Bird friendly design - Landscaping for parking lot runoff - Composting toilets - Proactive maintenance - Green cleaning.

UNIT-V:

Green Building Policies and Incentives: Green products and material certification - parameters making products green - products transparency movement - Cradle to cradle certification - Product emission testing - Carbon trust - Carbon credit - Returns on investments - Savings - Policies towards electrical power in India - Tax credits and Grants.

Green Building Rating Systems: Overview of green building rating systems: BREAM, LEED and GRIHA.

TEXT BOOKS:

1. Green Building Handbook: Volume 1, A Guide to Building Products and their Impact on the Environment, Tom Woolley, Sam Kimmins, Rob Harrison, Paul Harrison, Taylor & Francis
2. Sustainable Construction: Green Building Design and Delivery, 5th Edition by Charles J. Kibert, Wiley Publishing

REFERENCES:

1. Green Building Fundamentals: A Practical Guide to Understanding and Applying Fundamental Sustainable Construction Practices and the LEED System, Pearson, USA
2. Sustainable Construction and Design-II, Regina Leffers, Pearson / Prentice Hall, 2009

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CE401) SMART MATERIALS AND STRUCTURES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Smart Cities Planning and Development, Green Building Technology

COURSE OBJECTIVES:
- To introduce various smart materials and their working principles
- To acquire knowledge on different measuring techniques
- To learn about various smart sensors, actuators and their application in structural health monitoring
- To acquire knowledge on different smart composite materials and their modelling concepts
- To learn about the data acquisition and processing and their application in engineering domain

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the different smart materials and their principles
CO-2: Explain and understand different measuring techniques
CO-3: Identify suitable smart sensors and actuators for a specific engineering application
CO-4: Gain the knowledge on data acquisition and processing and advantages in smart materials and smart structures

UNIT-I:
Introduction: Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT-II:
Measuring Techniques: Measuring techniques: Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT-III:
Sensors & Actuators: Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – LVDT – Fiber optic Techniques- Application of Smart Sensors for Structural Health Monitoring (SHM), System Identification using Smart Sensors
Actuators: Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys –Electro

rheological fluids – Electromagnetic actuation – Role of actuators and Actuator Materials - IPMC and Polymeric Actuators, Shape Memory Actuators

UNIT-IV:

Signal Processing and Control Systems: Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear

UNIT-V:

Advances in Smart Structures & Materials: Self-Sensing Piezoelectric Transducers, Energy Harvesting Materials, Autophagous Materials, Self-Healing Polymers, Intelligent System Design, Emergent System Design

TEXT BOOKS:

1. Smart Materials and Structures, Gandhi M. V. and Thompson B. S., Chapman & Hall, 1992
2. Dynamics and Control of Structures, Meirovitch L., John Wiley, 1992

REFERENCES:

1. Smart Structures: Analysis and Design, A. V. Srinivasan, D. Michael McFarland, Cambridge University Press, 2009
2. Smart Materials and Technologies: For the Architecture and Design Professions, Michelle Addington and Daniel L. Schodek, Routledge, 2004
3. Smart Structures and Materials, Brian Culshaw, Artech House – Borton, 1996

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1CE402) INTELLIGENT TRANSPORTATION SYSTEM

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Smart Cities Planning and Development, Green Building Technology, Smart Materials and Structures

COURSE OBJECTIVES:
- To understand ITS architecture and standards
- To apply appropriate ITS technology depending upon site specific conditions
- To design and implement ITS components
- To understand concept and application of Automated Highway Systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Differentiate different ITS user Services
CO-2: Apply ITS for road user safety
CO-3: Interpret importance of AHS in ITS
CO-4: Extend future research and special project

UNIT-I:
Introduction To ITS: System Architecture, Standards, Database – Tracking Database – Commercial Vehicle Operations – Intelligent Vehicle Initiative - Metropolitan ITS – Rural ITS – ITS for Rail network.

UNIT-II:
ITS Travel Management: Autonomous Route Guidance System – Infrastructure based systems – Telecommunications – Vehicle – Roadside communication – Vehicle Positioning System – Electronic Toll Collection – Electronic Car Parking

UNIT-III:
ITS Designs: Modeling and Simulation Techniques - Peer – to – Peer Program – ITS for Road Network – System Design – Mobile Navigation Assistant – Traffic Information Center – Public Safety Program.

UNIT-IV:
Automated Highway Systems: Evolution of AHS and Current Vehicle Trends - Vehicles in Platoons – Aerodynamic Benefits - Integration of Automated Highway Systems – System Configurations - Step by Step to an Automated Highway System- Spacing and Capacity for Different AHS Concepts – Communication Technologies for AHS - The Effects of AHS on the Environment – Regional Mobility - Impact Assessment of Highway Automation.

UNIT-V:

Implementation of ITS: ITS programs globally- overview of ITS in developed countries and developing countries – ITS at Toll Plazas – Parking lots – Highways.

TEXT BOOKS:

1. Intelligent Transport Systems Handbook: Recommendations for World Road Association (PIARC), Kan Paul Chen, John Miles, 2000
2. Intelligent Transport Systems – Cases and Policies, Roger R. Stough, Edward Elgar, 2001
3. Intermodal Freight Transport, David Lowe, Elsevier Butterworth-Heinemann, 2005

REFERENCES:

1. Positioning Systems in Intelligent Transportation Systems, Chris Drane and Chris Rizos, Artech House Publishers, 2000
2. Perspectives on Intelligent Transport Systems, Joseph M. Sussman, Springer, 2000
3. Intelligent Transport System, Intelligent Transportation Primer, 2001

WASTE MANAGEMENT

WASTE MANAGEMENT

Offered by: **CIVIL ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Waste Management	Solid Waste Management	Hazardous Waste Management	Waste to Energy	Intelligent Waste Management and Recycling System

WASTE MANAGEMENT

The courses such as solid waste management (SWM), hazardous waste management (HWM), waste to energy (WTE) and intelligent waste management and recycling system (IWM&RS) are the courses available in the waste management track stream which having a potential syllabus content to meet out the industrial and research needs.

Solid waste management is an interesting track course which actual highlights the day-to-day problems where everybody is facing due to the improper management of industrial, domestic and household waste. Further, the enthusiastic aspects involved in the track courses such as: awareness on its impact over on environment, formal or scientific way of handling and management of waste and disposal scenarios.

In hazardous waste management course, handling and management of nuclear waste at national and international level have been highlighted. Further, the content enlightens about the legal process of state, central and industrial responses toward any emergency situations arise by hazardous waste. Finally, it deals about natural resource damage assessment and restoration.

Waste to energy is a pioneering course available in the track; it is one of the interesting and mindboggling course in the track which highlights the importance of converting the waste materials into wealth. It gives enough space to understand the basic process technologies in a theoretical and industrial way such as: thermal, chemical and biological conversion process. From the above, biological conversion process is in its embryonic state and having potential to expands its technological wings in the near future and having enormous scope of industrial applications where students can be benefited. Finally, conversion devices is an innovative module have been framed to explore the young minds in the line of designing and creating a demand based conversion device products which even lays an entrepreneurial pathway to them.

First of its kind, even at both international and national level a dedicated and extensive course for intelligent waste management and recycling system have been framed with conventional and advanced modules. It is really an interesting course where a student can apply his/her innovative creations to solve the existing and futuristic problems in a smart way with the help of smart tools. Optimistic modules such as: life cycle assessment and carbon-footprint-based IWMS, principles of systems engineering and regulatory frameworks have been incorporated to meet out the international requirements.

In the pathway of exploring the fundamentals and basic knowledges about the course, the six units of all the courses have been formulated keeping in the mind that the students can be able to competitive among the international community at the end of semester. In this context, comprehensive theoretical and industrial processes have been incorporated in each and every module of courses. Further, it is highly believed that the framed syllabus modules having 100% industrial applications which can make the students to feel motivated, satisfied and confidence to compete with the international community.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CE303) SOLID WASTE MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To learn about different types of solid and hazardous wastes, their sources, classification systems, and regulatory framework for management
- To understand techniques for waste sampling, characterization, and minimization through reduce-reuse-recycle concepts
- To study various storage, collection, and transportation systems for efficient and safe handling of different waste streams
- To impart knowledge on biological, thermal, and other technologies for processing and treatment of solid and hazardous wastes

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Classify different types of wastes and interpret regulatory policies on their handling

CO-2: Select appropriate waste sampling and characterization methods and design waste minimization programs

CO-3: Plan and design efficient storage, collection, and transportation systems for municipal solid wastes

CO-4: Compare applicable biological and thermal waste treatment technologies for energy and resource recovery and disposal

UNIT-I:

Sources, Classification and Regulatory Framework: Types and Sources of solid and hazardous wastes - Need for integrated solid and hazardous waste management – Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, e-wastes, plastic wastes, construction & demolition wastes, nuclear wastes - Elements of circular economy and integrated waste management - Roles and responsibilities of stakeholders – Financing and Public Private Partnerships for waste management.

UNIT-II:

Waste Characterization and Minimization: Waste generation rates and variation - Composition, physical, chemical, and biological properties of solid wastes – Hazardous Characteristics and TCLP tests – tools and software for waste sampling and characterization - Waste minimization techniques - Extended Producer Responsibility - Recycling, recovery, and reuse strategies - Concept of zero waste.

UNIT-III:

Storage, Collection and Transportation of Wastes: Onsite handling, storage, and segregation - Storage and collection of municipal solid wastes – Analysis of collection systems - Transfer stations design, operation, and optimization - Compatibility considerations, labelling, manifest system and safety transportation of hazardous wastes.

UNIT-IV:

Waste Processing Technologies: Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes.

UNIT-V:

Waste Disposal: Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation

TEXT BOOKS:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A. Vigil, McGraw-Hill International, 1993
2. Handbook of Solid Waste Management, George Techobanoglous and Frank Kreith, McGraw-Hill, 2002
3. Solid Waste Management, K. Sasi Kumar & S. Gopi Krishna, Prentice-Hall, 2009

REFERENCES:

1. Management of Municipal Solid Waste, T. V. Ramachandra, The Energy and Resources Institute, TERI, 2009
2. Municipal Solid Waste Management in India, Subhrabaran Das and Korobi Gogoi, VDM Verlag, 2010
3. Solid Waste Engineering, William A. Worrell and P. Aarne Vesilind, 2nd Edition, Cengage Learning, 2000
4. CPHEEO, Manual on Municipal Solid Waste Management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1CE304) HAZARDOUS WASTE MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Solid Waste Management

COURSE OBJECTIVES:
- To understand the concepts of hazardous waste management
- To understand the principle of waste characterization, storage, transport and processing
- To understand the principles of nuclear waste and Hazardous Management (HM) and emergency Response
- To understand the principle and process of landfills and natural resource Damage Assessment & Restoration

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the fundamental concepts of hazardous waste management
CO-2: Apply the knowledge to resolve the problems on storage, transport and processing
CO-3: Apply the knowledge to resolve the practical problems on nuclear waste and HM & emergency response
CO-4: Impart the gained knowledge and skills to resolve the practical problems on landfills and natural resource damage assessment & restoration on field

UNIT-I:
Introduction to Hazardous waste management: Need for hazardous waste management – Sources of hazardous wastes – Effects on community – classification – Storage and collection of hazardous wastes – Problems in developing countries – Protection of public health and the environment.

UNIT-II:
Waste Characterization, Storage, Transport and Processing: Hazardous Waste Characterization– Hazardous waste inventory- Source reduction of hazardous wastes - Handling and storage of Hazardous wastes –Waste Compatibility Chart –
– Hazardous waste treatment technologies – Physical, chemical and thermal treatment of hazardous waste – Solidification – Chemical fixation – Encapsulation – Incineration.

UNIT-III:
Nuclear Waste: Characteristics – Types – Nuclear waste – Uranium mining and processing – Power reactors – Refinery and fuel fabrication wastes – spent fuel – Management of nuclear wastes – Decommissioning of Nuclear power reactors –
Health and environmental effects.

UNIT-IV:
Management of Hazardous Wastes: Identifying a hazardous waste – methods – Quantities of hazardous waste generated – Components of a hazardous waste management plan – Hazardous waste minimization – Disposal practices in Indian Industries – Future challenges - Emergency Response - National Response Team and Regional Response Teams; National Contingency Plan and Regional Contingency Plans; National Response Center; State, Local and Industry Response Systems, Secured Landfill.

UNIT-V:
Natural Resource Damage Assessment and Restoration: Natural Resource Damage Assessment Laws and Regulations - Central and State government agencies - Damage Assessment and Restoration Procedures - Groundwater Hydrology and Contamination Processes - Groundwater Contamination Detection, Analysis and Monitoring - Hazard Ranking System - Remedial Investigations and Feasibility Studies.

TEXT BOOKS:
1. Hazardous Waste Management, Charles A. Wentz., 2nd Edition, McGraw-Hill International, 1995
2. Standard Handbook of Hazardous Waste Treatment and Disposal, Harry M. Freeman, McGraw-Hill, 1997

REFERENCES:
1. Hazardous Waste (Management and Transboundary Movement) Rules, Ministry of Environment and Forests, Government of India
2. Guidelines and Criteria for Hazardous Waste Landfills and Hazardous Waste Treatment Disposal Facilities, Central Pollution Control Board, 2010
3. Hazardous Waste Management, Prof. Anjaneyulu
4. Hazardous Waste Management, M. LaGrega and others, McGraw-Hill

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CE403) WASTE TO ENERGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Solid Waste Management, Hazardous Waste Management

COURSE OBJECTIVES:
- To learn about different types of waste as potential fuel and related conversion technologies for energy recovery
- To understand fundamental principles and systems involved in thermal waste processing methods like incineration, gasification etc.
- To study various chemical processes and technologies for conversion of biomass and waste to fuel and other products
- To impart knowledge on biological waste treatment methods and biomass energy technologies

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Ability to identify and characterize suitable waste derived fuels and assess environmental impacts of waste-to-energy systems
CO-2: Ability to analyze key parameters and design considerations for thermal waste processing systems
CO-3: Ability to select appropriate chemical conversion methods for production of hydrocarbons, biodiesel etc. from biomass waste
CO-4: Ability to understand kinetics and design bio-digestion systems for organic waste treatment and energy recovery

UNIT-I:
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, forest residue, industrial waste, MSW – conversion devices – incinerators, gasifiers, digesters, Environmental monitoring system for land fill gases, Environmental impacts; Measures to mitigate environmental effects due to incineration.

UNIT-II:
Thermal Conversion Technologies: Fundamentals of thermal processing – combustion system – pyrolysis system – gasification system – environmental control system – energy recovery system – incineration. Briquetting technology: Production of RDF and briquetted fuel.

UNIT-III:
Chemical Conversion Technologies: Acid & Alkaline hydrolysis – hydrogenation; solvent extraction of hydrocarbons; solvolysis of wood; biocrude; biodiesel production via chemical process; catalytic distillation; transesterification methods; Fischer Tropsch

diesel: chemicals from biomass - various chemical conversion processes for oil, gas, cellulose acetate.

UNIT-IV:

Biological Conversion Technologies: Nutritional requirement for microbial growth – types of microbial metabolism – types of microorganisms – environmental requirements – aerobic biological transformation – anaerobic biological transformation – aerobic composting – low solid anaerobic digestion – high solid anaerobic digestion – development of anaerobic digestion processes and technologies for treatment of the organic fraction of MSW – Biodegradation and biodegradability of substrate; biochemistry and process parameters of bio methanation - other biological transformation processes.

UNIT-V:

Biomass Energy Technologies: Biomass energy resources – types and potential; Energy crops - Biomass characterization (proximate and ultimate analysis); Biomass pyrolysis and gasification; Biofuels – biodiesel, bioethanol, Biobutanol; Algae and biofuels; Pellets and bricks of biomass; Biomass as boiler fuel; Social, economic, and ecological implications of biomass energy.

TEXT BOOKS:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, McGraw-Hill International, 1993
2. Energy from Waste - An Evaluation of Conversion Technologies, C. Parker and T. Roberts, Elsevier Applied Science, 1985

REFERENCES:

1. Introduction to Biomass Energy Conversion, Capareda S., CRC Press, 2013
2. Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power, Brown RC and Stevens C, Wiley and Sons, 2011
3. Biomass Conversion Processes for Energy and Fuels, Sofer, Samir S. (Ed.), Zaborsky, R. (Ed.), Plenum Press, 1981
4. Energy Recovery from Municipal Solid Waste Thermal Conversion Technologies, P. Jayarama Reddy, CRC Press, Taylor & Francis Group, 2016

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CE404) INTELLIGENT WASTE MANAGEMENT SYSTEM AND RECYCLING SYSTEM

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Solid Waste Management, Hazardous Waste Management, Waste to Energy

COURSE OBJECTIVES:
- To understand the concepts of IWMS Tools
- To understand applications of IWMS Tools in SWM
- To understand the concepts of Life Cycle Assessment and Carbon-Footprint-Based IWMS
- To understand the applications of IoT, ML, DL, BC and LCA & Carbon Foot Print (CFP) based SWM

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of IWMS tools
CO-2: Acquire the knowledge to resolve the practical problems with the help of IWMS Tools.
CO-3: Analyze Life Cycle Assessment and Carbon-Footprint-Based IWMS
CO-4: Apply the knowledge of IoT, ML, DL, BC and LCA & CFP to resolve the practical problems in SWM

UNIT-I:
Introduction to IWMS Tools: Introduction – Need of the IWMS – functional elements of IWMS – Ultrasonic Sensor, Arduino Board, GSM Module, Bread Board, Power Supply (Battery) – Jump Wires - Navigation system – Cloud Services - Zero Waste Principle.

UNIT-II:
Applications of IOT in Intelligent Waste Management System: Introductory Applications of IoT, Machine Learning, Deep Learning and Block Chain Technology in Waste Characterization and Source Reduction, Storage, Collection and Transport of Wastes, Waste Processing Technologies and Waste Disposal.

UNIT-III:
Life Cycle Assessment and Carbon-Footprint-Based IWMS: Phases of Life Cycle Assessment: Goal and Scope Definition - Life Cycle Inventory - Life Cycle Impact Assessment – Interpretation - LCA Waste Management Software - Umberto Software.

UNIT-IV:
Sima Pro Software - LCA Assessment Methodology: Life Cycle Inventory Analysis - Life Cycle Impact Assessment – Interpretation - Sensitivity Analysis - Carbon-Footprint-

Based SWM - The Global-Warming Potential Impact - GHG Accounting - GWP Assessment for Solid Waste Management.

UNIT-V:

Engineering Principles and Tools for SWM: Systems Engineering Principles and Tools for SWM - Planning Regional Material Recovery Facilities - Optimal Planning for Solid Waste Collection, Recycling, and Vehicle Routing – Multi attribute Decision Making with Sustainability Considerations - Decision Analysis for Optimal Balance between Solid Waste Incineration and Recycling Programs - Environmental Informatics for Integrated Solid Waste Management - Future Perspectives.

TEXT BOOKS:

1. Sustainable Solid Waste Management - A Systems Engineering Approach, Ni-Bin Chang and Ana Pires, IEEE & John Wiley, Hoboken, 2015
2. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen and Samuel A. Vigil, McGraw-Hill International, 1993

REFERENCES:

1. Manual on Municipal Solid Waste Management, CPHEEO, Central Public Health and Environmental Engineering Organization, Government of India, 2014
2. Smart Waste Management- Nutshell, Vishal Gupta, Amazon.com Services LLC, 2017
3. Recyclable Household Waste Management System for Smart Home in IOT, Manpreet Kaur & Dr. Kamaljit Singh Saini, Independently, 2018
4. GoI, Ministry of Environment and Forest and Climate Change, Various Recent Laws and Rules of Solid Waste Management

GREEN ENERGY

Offered by: **ELECTRICAL AND ELECTRONICS ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Green Energy	Renewable Energy Sources	Renewable Energy Technologies	Energy Storage Technologies	Energy Management and Conservation

1. RENEWABLE ENERGY SOURCES

What we are studying?

The climate landscape is changing rapidly, and new technologies and solutions keep arising to respond to global and local challenges.

Renewable energy sources course makes you discover how Solar Thermal Energy conversion system works. It makes you understand how a Solar Photo voltaic generation system generates electricity. Scope of the course also includes wind energy generation. It also navigates you through Biomass and geo thermal energy generation systems.

Job opportunities:

When it comes to the hottest and most buzzing careers in the 21st century, the majority of people think of hardcore technical domains such as data science, machine learning & artificial intelligence. Few people might also come up with biotechnology (or biosciences). But, quite often people forget about one of the dark horses – the Renewable Energy sector. Even Bill Gates lobbied for the Energy sector as one of the top three career choices for making an impactful career.

Reference:

https://www.stoodnt.com/blog/careers-in-renewable-energy-job-opportunities-fields-of-study-and-top-universities/

2. RENEWABLE ENERGY TECHNOLOGIES

Within Crisis, there are seeds of opportunity..! We are at the wedge of fossil fuel end. After few years you can witness fuel crisis all over the world, as an engineer one must aware of the solution. To design sustainable systems those last for decades, one must use renewable energy as main or auxiliary source of energy. The application may be electrical or mechanical or chemical, one must convert energy from renewable source into electricity for ease of use.

Renewable Energy Technologies course will introduce you to Different types of Solar PV systems and their characteristics. Students will know the functionality of Power Converters such as Inverters etc., through block diagram approach. Fuel cell technology, which is one of the solutions for energy crisis will be discussed in detail. Course will conclude by discussing impact of PV panel production on environment and disposal of it.

Job Opportunities:

Green jobs in the renewable energy sector are expected to touch new figures with 6 digit monthly income. Following link may describe the interesting interdisciplinary careers for budding engineers.

Reference:

https://www.businessinsider.in/slideshows/miscellaneous/21-high-paying-careers-for-people-who-want-to-save-the-planet-and-also-have-job-security/slidelist/70677782.cms#slideid=70677804

3. ENERGY STORAGE TECHNOLOGIES

Battery technology is an essential skill for every engineer in present scenario. Course on energy storage technologies will enable student to, Design storage system Residential loads integrated to Renewable and storage systems for Electric Vehicles. It will make student to understand various electrochemical storages such as Lead acid, Li Ion cell etc. and their characteristics. The course enables student to compare non-electric, electric storage systems and analyze application of them to various domains.

Job opportunities:

Upon successful completion of course student will enhance the chances of getting into EV industry, which almost open fact. Job Profiles include

i. Battery algorithms engineer
ii. Battery management engineer
iii. Battery modeling expert
iv. Design engineer – EV

4. ENERGY MANAGEMENT AND CONSERVATION

Energy Management And Conservation course is mainly intended to monitor Energy consumption of industries and to manage energy systems. This course also deals with methods of improving efficiency of electric machinery and to design a good illumination system. It also teaches student calculate pay back periods for energy saving equipment.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EE301) RENEWABLE ENERGY SOURCES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the role of various renewable energy sources
- To know the solar thermal & PV system conversions
- To understand the energy conversion principles of wind & biomass
- To learn energy extraction process of ocean & geo thermal resources

COURSE OUT COMES: After completion of the course, the student should be able to
CO-1: Understand Solar Thermal Energy conversion principles
CO-2: Understand Solar Photo voltaic system
CO-3: Analyze wind & biomass energy conversion system
CO-4: Understand the geo thermal & ocean energy conversion principles

UNIT-I:
Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, The apparent motion of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sunshine, solar radiation data.

UNIT-II:
Solar Thermal Energy Conversion: Types of solar thermal collectors-Evaluation of the performance of solar collectors- Selective coatings for collectors and glazing, Solar heating systems -Individual and collective solar water heaters.
Concentric Solar Power Plants- Concentrating systems- Components for production of heat and conversion into electricity.

UNIT-III:
Solar PV Conversion: The PV Cell-Crystalline Solar cells-Thin film solar cell, Module, Array, Equivalent Electrical circuit, Open circuit voltage and Short circuit current, I-V, P-V Corves, Array design- Sun angle- effect of Temperature-Sun tracking, PV system components

UNIT-IV:
Wind & Bio-Mass Energy: Basic Principle of wind energy conversion, Nature of wind. Wind turbine types & construction. Power in the wind- Betz criteria, performance characteristics. Speed Control strategies of wind turbine-Yaw control & Pitch control. working of Induction generator (Principle only).

Sources of Biomass & usable forms, Principles of Bio-Conversion-Photosynthesis, Biomass conversion - Anaerobic Fermentation & various stages of digestion process. Bio-gas plants-Floating drum, Fixed dome types.

UNIT-V:

Geothermal & Ocean Energy: Resources, types of wells, methods of harnessing the energy-Dry steam, wet steam-single Flashed steam-binary cycle power plants. OTEC-conversion technology-Claude cycle, Andreson cycle. Tidal energy-Origin and nature, tidal energy conversion schemes- single basin, double basin. wave energy: wave conversion devices-Heaving float type, pitching type, oscillating water column. Micro-hydro power generation-Layout.

TEXT BOOKS:

1. Non-Conventional Energy Sources, B. H. Khan, McGraw-Hill
2. Renewable Energies, John Claude Sabbonedere, ISTE & John Wiley, 2007
3. Renewable Energy Resources, Twidell & Wier, CRC Press (Taylor & Francis), 2016

REFERENCE:

1. Wind & Solar Power Systems, Mukund R. Patel, CRC Press, 2003

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/121/106/121106014/
2. https://onlinecourses.nptel.ac.in/noc21_ch11/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EE302) RENEWABLE ENERGY TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Renewable Energy Sources

COURSE OBJECTIVES:
- To provide necessary knowledge about the modeling, design and analysis of various PV systems
- To show that PV is an economically viable, environmentally sustainable alternative to the world's energy supplies
- To understand the power conditioning of PV and WEC system's power output

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Model, analyze and design various photovoltaic systems
CO-2: Know the feasibility of PV systems as an alternative to the fossil fuels
CO-3: Design efficient stand alone and grid connected PV and WEC power systems

UNIT-I:
Behavior of Solar Cells-Basic Structure and Characteristics: Types - equivalent circuit-modeling of solar cells including the effects of temperature, irradiation and series/shunt resistances on the open-circuit voltage and short-circuit current-Solar cell arrays- PV modules-PV generators- shadow effects and bypass diodes- hot spot problem in a PV module and safe operating area.

UNIT-II:
Types of PV Systems: Grid connected PV systems- Net-metering- Estimation of actual a.c. output power from PV systems.
Stand-alone system- Approach to designing an off-grid PV system with battery- with battery and diesel generator- Stand-alone solar water pumping system- Sizing/designing PV water pumping system- Procedure for decommissioning of PV plant.

UNIT-III:
Power Converters for PV and Wind: Basic switching devices, AC-DC Rectifier, DC-AC inverter (Basic operation), DC DC converter - Buck, Boost converters Basic operation, Battery charger (Basic operation), grid interface requirements in Renewable energy integration

UNIT-IV:
Maximum Power Point Tracking: Various Sources of Losses is PV system, Charge Control in Battery Backed PV Systems, Maximum Power Point Tracking (MPPT)- Role of DC-DC

converter in MPP tracking- Perturb and Observe Method-pseudo program for P&O method, Advanced Issues & Algorithms- search steps-variable step size algorithm.

UNIT-V:

Fuel Cell Technology: History of Fuel cells, Fuel Cell Vehicle Emissions, Hydrogen safety factors, Principle of Operation- Fuel cell Model- cell voltage, Power and efficiency of fuel cell, Various types of fuel cells, Various storage systems for Hydrogen, Applications.

TEXT BOOKS:

1. Handbook of Renewable Energy Technology, Ahmed F. Zobaa, World Scientific, 2011
2. Wind and Solar Power Systems Design, Analysis, and Operation, Patel M. R., 2nd Edition, CRC Press, 2005
3. Practical Handbook of Photovoltaics - Fundamentals and Applications, Augustin McEvoy, Tom Markvart, T. Markvart, L. Castaner, Elsevier Science, 2003

REFERENCE:

1. Electric Powertrain - Energy Systems, Power Electronics & Drives for Hybrid, Electric & Fuel Cell Vehicles, Goodarzi, Gordon A., Hayes, John G., John Wiley & Sons, 20

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EE401) ENERGY STORAGE TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Renewable Energy Sources, Renewable Energy Technologies

COURSE OBJECTIVES:
- To understand techno economic analysis of various storage systems
- To know feasibility of different storage technologies
- To learn operation of several electrochemical storage systems
- To understand Functionality of non-electric storage systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Design storage system residential loads integrated to renewable and storage systems for electric vehicles
CO-2: Understand various electrochemical storage system
CO-3: Understand terminology and characteristics of electro chemical systems
CO-4: Compare non-electric and electric storage system
CO-5: Analyze application of storage systems to various domains

UNIT-I:
Techno-economic Analysis of Various Energy Storage Technologies: Electrical Energy Storage (EES)-Definition-Role, Energy storage components, Applications and Technical support, Financial Benefits of EES, Techno economic analysis, Classification of Energy Storage systems, Comparison

UNIT-II:
Estimation of Energy Storage and Feasibility Analysis: Background-Solar Power-Wind Power (Brief discussion), Estimation-daily residential load-daily available solar energy-daily available wind energy-Importance, Estimation of Storage sizing- Steps for Storage sizing- Grid connected residential PV-grid connected residential Wind-hybrid system, Feasibility analysis of Storage systems- Various Terms involved- Case study of comparison between Off grid and grid connected systems

UNIT-III:
Electro Chemical Storage: Standard Batteries- Lead Acid- VRLA - Ni-cd, Modern Batteries- Ni MH- Li Ion, Flow Batteries – Br2 Zn-Vanadium Redox, Battery composition, construction, Principle of operation, Types, Advantages and disadvantages to above batteries.

UNIT-IV:
Terminology & Characteristics: Battery Terminology, Capacities, Definitions of various characteristics, Different States of charge-DOD-SOC-SOE-SOH-SOF, Resistance,

Battery Design, Battery Charging, Charge Regulators, Battery Management, General Equivalent Electrical Circuit, Performance Characteristics

UNIT-V:

Non-Electric Storage Technologies: Flywheel, Energy Relations, Flywheel System Components, Benefits of Flywheel over Battery, Superconducting Magnet Energy Storage, Compressed Air Energy storage, Overview Thermal Energy Storage. Capacitor bank storage, Comparison of storage Technologies

Applications: Domains of applications of Energy storage- Starter-Traction-stationary-mobile or nomadic, Review of storage requirements, Storage for Electric Vehicle application, Storage for hybrid vehicle-Regenerative Braking-Super capacitor-hybrid capacitor

TEXT BOOKS:

1. Energy Storage Technologies and Applications, Ahmed Faheem Zobaa, InTech Publishers, 2013
2. Lithium Batteries and Other Electrochemical Storage Systems, Christian Glaize, Sylvie Geniès, ISTE & John Wiley, 2013
3. Wind and Solar Power Systems, Mukund R. Patel, 2nd Edition, CRC Press, 2006

REFERENCE:

1. Rechargeable Batteries Applications Handbook, EDN Series for Design Engineers, Elsevier

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EE402) ENERGY MANAGEMENT AND CONSERVATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Renewable Energy sources, Renewable Energy Technologies, Energy Storage Technologies

COURSE OBJECTIVES:
- To understand the necessity of conservation of energy
- To know the methods of energy management
- To identity the factors to increase the efficiency of electrical equipment
- To know the benefits of carrying out energy Audits

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Conduct energy audit of industries
CO-2: Manage energy Systems
CO-3: Specify the methods of improving efficiency of electric motor
CO-4: Improve power factor and to design a good illumination system
CO-5: Calculate pay back periods for energy saving equipment

UNIT-I:
Basic Principles of Energy Audit: Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit

UNIT-II:
Energy Management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manager, Qualities and functions, language, Questionnaire - check list for top management

UNIT-III:
Energy Efficient Motors: Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed, variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit

UNIT-IV:
Power Factor Improvement, Lighting and Energy Instruments: Power factor – methods of improvement, location of capacitors, p.f with non-linear loads, effect of harmonics on p.f., p.f motor controllers – simple problems

Lighting Energy Audit and Energy Instruments: Good lighting system design and practice, lighting control, lighting energy audit - Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, flux meters, tongue testers, application of PLC's

UNIT-V:

Economic Aspects and Analysis: Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis.

Analysis of Energy Efficient Motor: Energy efficient motors- calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

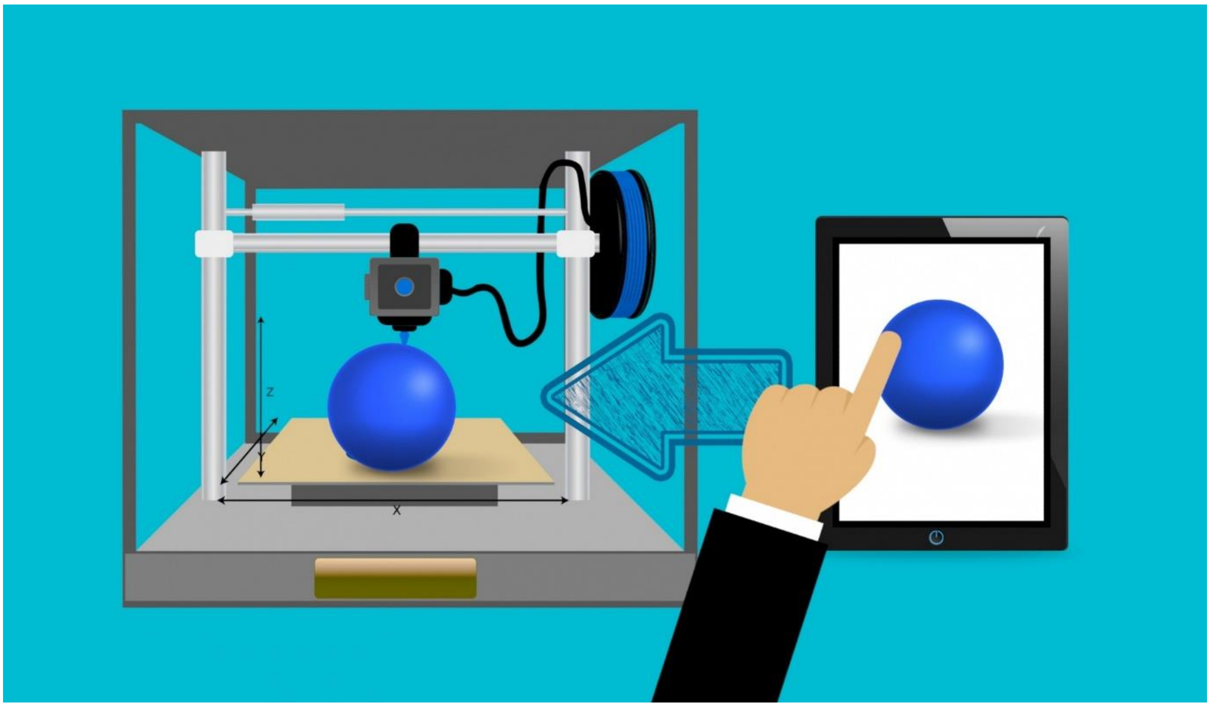
TEXT BOOKS:

1. Energy Management, W. R. Murphy & G. Mckay, Butterworth-Heinemann
2. Energy Management, Paul o' Callaghan, 1st Edition, McGraw-Hill, 1998

REFERENCES:

1. Energy Efficient Electric Motors, John C. Andreas, 2nd Edition, Marcel Dekker, 1995
2. Energy Management Handbook, W. C. Turner, John Wiley and Sons
3. Energy Management and Good Lighting Practice: Fuel Efficiency Booklet12-EEO

3D PRINTING AND DESIGN



3D PRINTING AND DESIGN

Offered by: **MECHANICAL ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
3D Printing and Design	Elements of CAD	Introduction to 3D Printing	3D Printing - Machines, Tooling & Systems	Reverse Engineering

3D PRINTING AND DESIGN

3D Printing is a process for making a physical object from a three-dimensional digital model by laying down many successive thin layers of a material. It brings a digital CAD model into its physical form by adding layer by layer of materials. Thus called 'Additive Manufacturing'. It is the opposite of subtractive manufacturing i.e., removing material from an object using a mechanical machine. It enables to produce complex shapes using less material than traditional manufacturing methods. There are several different techniques to 3D print an object. It saves time through prototyping and is also responsible for manufacturing impossible shapes. Due to these, it has many applications in different fields like consumer products (eyewear, footwear, design, furniture, industrial products (manufacturing tools, prototypes, functional end-use parts, dental products, prosthetics, architectural scale models, reconstructing fossils, replicating ancient artefacts, reconstructing evidence in forensic pathology etc.

3D printing has good prospects from career perspective. Various positions that could be available are CAD designers, engineers, technical developers, software developers, electronics engineers, etc.

This OE track consists of 04 courses and is designed with an objective to provide an overview of all the constituents of 3D Printing starting from elements of CAD that are needed to create CAD models, followed by basics of 3D Printing required for setting the parameters, then the machines and tools used in 3D Printing for thorough understanding of systems and processes and finally the reverse engineering of 3D printing models from actual objects.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1ME301) ELEMENTS OF CAD

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basics of CAD and the devices used
- To know the various types of modeling used in CAD
- To appreciate the concept of feature-based modeling and geometric transformations
- To comprehend the assembly modeling procedure and data exchange formats

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Use the fundamentals of CAD and its devices in design applications
CO-2: Identify the types of CAD modeling techniques and utilize them
CO-3: Evaluate the objects or models using geometric transformations and manipulations
CO-4: Perform the assembly modeling and asses the various data exchange formats

UNIT-I:
Fundamentals of CAD: Introduction to Computer-Aided Design (CAD), Design process, Application of Computers for Design and Manufacturing, Benefits of CAD, Overview of CAD / CAM Hardware, Display devices, Hard copy devices. Design Cycle, Raster scan graphics, coordinate systems.

UNIT-II:
Geometric Modeling: Introduction to Geometric Model, Types of modeling, Curve representation.
Wireframe Modeling: Introduction, advantages, limitations and applications, Wireframe entities-analytic and synthetic, Basic definitions of Cubic, Bezier, and B-spline curves.

UNIT-III:
Surface Modeling: Introduction, advantages, limitations and applications, surface entities, Basic definitions of analytic surfaces - planar surface, ruled surface, tabulated cylinder, surface of revolution; Basic definitions of synthetic surfaces - Bezier surface, B-spline surface.

UNIT-IV:
Solid Modeling: Introduction, advantages, limitations and applications, Solid Entities, Solid Representation schemes – Boundary Representation (B-Rep) scheme, Constructive Solid Geometry (CSG) scheme. Feature-based Modeling: Introduction, Feature entities, Feature representation, 3D Sketching, Parameter, Relations and Constraints.

Product Data Exchange: Introduction, Graphics Standards, Types of translators, Importance of formats in 3D Printing, Data exchange formats - IGES, STEP and STL.

UNIT-V:

Geometric Transformations: Introduction to 2D & 3D transformations, Brief treatment on Translation, Scaling, Reflection, and Rotation using Homogeneous and concatenated transformations Manipulations: Displaying, Segmentation, Trimming, Intersection, Projection. Assembly Modeling: Introduction, Assembly modeling, Assembly Tree, Mating Conditions, Bottom-up and Top-down approach.

TEXT BOOKS:

1. CAD/CAM Theory and Practice, Ibrahim Zeid, Tata McGraw-Hill, 2009
2. CAD/CAM: Concepts and Applications, Alavala, Prentice Hall International, 2018
3. Mastering CAD/CAM, Ibrahim Zeid, Tata McGraw-Hill, 2018

REFERENCES:

1. CAD/CAM-Computer Aided Design and Manufacturing, Mikell P. Groover, E. W. Zimmers, Pearson Education/Prentice Hall, 2018
2. CAD/CAM Principles and Applications, P. N. Rao, Tata McGraw-Hill, 2017
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, Pearson Education, 2000

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1ME302) INTRODUCTION TO 3D PRINTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of CAD

COURSE OBJECTIVES:
- To understand the need of 3D Printing
- To understand about the process chain involved in 3D Printing
- To know about the material extrusion, sheet lamination, liquid and jetting based techniques
- To know about the data formats and post processing methods involved in 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Summarize the importance of 3D Printing
CO-2: Explain the process chain involved in 3D Printing
CO-3: Explain about material extrusion, sheet lamination, liquid and jetting based techniques
CO-4: Apply the knowledge gained in data formats and post-processing methods

UNIT-I:
Introduction to 3D Printing: Introduction to 3D Printing, 3D Printing evolution, Classification of 3D Printing, Distinction between 3D Printing & CNC Machining, Advantages of 3D Printing, Artificial Intelligence and IOT in 3D Printing.

UNIT-II:
Generalized 3D Printing Process Chain: Process chain, Materials for 3D Printing, Design for 3D Printing and Overview of Medical Modeling & Reverse Engineering.

UNIT-III:
Material Extrusion and Sheet Lamination Techniques: Introduction, basic principles, Fused Deposition Modeling, Laminated Object Manufacturing (LOM), Advantages and Applications

UNIT-IV:
Liquid and Three-Dimensional Jetting Techniques: Stereolithography (SLA), Material Jetting, Binder Jetting, Advantages and Applications.

UNIT-V:
3D Printing Data Formats and Post Processing: STL Format, STL File Problems, Brief Overview of other translations - IGES File, HP/GL File and CT data.

Post-Processing: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements.

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles & Applications, Chuaa Chee Kai, Leong Kah Fai, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping: Theory and Practice, Ali K. Karmani, Emand Abouel Nasr, Springer, 2006
2. Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Andreas Gebhardt, Hanser Publishers, 2013
3. Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Hopkinson, N. Haque, and Dickens, Taylor and Francis, 2007

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1ME401) 3D PRINTING - TOOLING AND SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of CAD, Introduction to 3D Printing

COURSE OBJECTIVES:
- To understand the need of prototyping
- To understand about the liquid and solid based 3D printing systems
- To know about the Laser based 3D Printing Systems
- To know about the Rapid Tooling and applications of 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Summarize the importance of Prototyping
CO-2: Explain the process involved in liquid and solid based 3D printing systems
CO-3: Explain the laser-based 3D Printing Systems
CO-4: Adapt the knowledge gained in rapid tooling and applications of 3D Printing

UNIT-I:
Introduction: Prototype Fundamentals, Types of Prototypes, Roles of Prototypes, Phases of Development Leading to Rapid Prototyping, Fundamentals of Rapid Prototyping.

UNIT-II:
Liquid Based 3D Printing Systems: Introduction, Principles, Processes and Applications of Solid Ground Curing, Material Jetting & Binder Jetting

UNIT-III:
Solid Based 3D Printing Systems: Introduction, Principles, Processes and Applications of Fused Deposition Modelling (FDM), Paper Lamination Technology (PLT) and Laminated Object Manufacturing (LOM)

UNIT-IV:
Laser Based 3D Printing Systems: Selective Laser Sintering (SLS)-Principle, Process and Applications, Three-Dimensional Printing- Principle, Process and Applications, Laser Engineered Net Shaping (LENS)- Principle, Process and Applications, Overview of Direct Energy Deposition.

UNIT-V:
Rapid Tooling and Applications of 3D Printing: Introduction and need for Rapid Tooling, Overview of Indirect and Direct Processes, Applications
Applications of 3D Printing: Brief overview of Applications in Design, Engineering, Aerospace Industry, Automotive Industry and Biomedical Industry

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W. Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles & Applications, Chuaa Chee Kai, Leong Kah Fai, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping: Theory and Practice, Ali K. Karmani, Emand Abouel Nasr, Springer, 2006
2. Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Andreas Gebhardt, Hanser Publishers, 2013
3. Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Hopkinson, N. Haque, and Dickens, Taylor and Francis, 2007

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1ME402) REVERSE ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of CAD, Introduction to 3D Printing, 3D Printing Machines, Tooling & Systems

COURSE OBJECTIVES:
- To understand the Reverse Engineering (RE) and its methodologies
- To comprehend Data Acquisition Techniques for Reverse Engineering
- To understand Integration Between Reverse Engineering and Additive manufacturing
- To know the applications of reverse engineering

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Basic understanding of Reverse Engineering and its methodologies
CO-2: Understanding the data acquisition techniques for reverse engineering
CO-3: Understanding of amalgamation Between Reverse Engineering and Additive manufacturing
CO-4: Adapt the knowledge gained in reverse engineering for various applications

UNIT-I:
Introduction to Reverse Engineering: Scope and tasks of RE, Process of duplicating, Definition and use of RE, The Generic Process, History of Reverse Engineering, Overview of Applications

UNIT-II:
Methodologies and Techniques: Potential for Automation with 3-D Laser Scanners, Computer-aided (Forward) Engineering, Computer-aided Reverse Engineering, Computer Vision and Reverse Engineering

UNIT-III:
Data Acquisition Techniques
Contact Methods: Point-to-point sensing with touch-trigger probes, analogue sensing with scanning probes, Coordinate Measurement Machine (CMM)-CNC machines and CMM- Articulated Arms,
Noncontact Methods: Triangulation, Structured Light, and Destructive Method

UNIT-IV:
Integration Between Reverse Engineering and Additive Manufacturing: Modeling Cloud Data, Integration of RE and AM for Layer-based Model Generation, Adaptive Slicing Approach for Cloud Data Modeling.

UNIT-V:

Applications

Automotive: Workflow for Automotive Body Design, Reverse Engineering for Better Quality

Aerospace: RE in Aerospace–A Work in Progress, Reducing Costs of Hard Tooling

Medical: Orthodontics, Hearing Instruments, Knee Replacement

TEXT BOOKS:

1. Reverse Engineering: An Industrial Perspective, V. Raja and K. Fernandes, Springer-Verlag
2. Reverse Engineering, K. A. Ingle, McGraw-Hill
3. Rapid Prototyping, Ali Kamrani, Emad Nasr, Springer, 2006

REFERENCES:

1. Smart Product Engineering, Michael Abramovici, Rainer Stark, Springer Berlin Heidelberg
2. Product Design: Techniques in Reverse Engineering and New Product Development, K. Otto and K. Wood, Prentice Hall, 2001

INTERNET OF THINGS

INTERNET OF THINGS

Offered by: **ELECTRONICS AND COMMUNICATION ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Internet of Things	Sensors Transducers and Actuators	Introduction to Microcontrollers and Interfacing	Fundamentals of Internet of Things	Wireless Sensor Networks

INTERNET OF THINGS

Internet of Things: The IoT creates opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions. *IoT* **is changing how we live, work, travel, and do business. It is even the basis of a new industrial transformation, known as** Industry 4.0**, and key in the** digital transformation **of organizations, cities, and society overall.** The IoT track helps students to learn about how to

- Learn different protocols and connectivity technologies used in IOT.
- Expose the various sensors and transducers for measuring mechanical quantities.
- Develop simple applications using 8051 microcontrollers.
- Understand the key routing protocols for sensor networks and their design issues.

Some of the more common career paths in the Internet of Things path are

- IoT Developer. ...
- IoT Architect…
- IoT Embedded Systems Designer…
- IoT Solutions Engineer…
- Professional in Sensors and Actuators…
- Embedded Programs Engineer…
- Safety Engineer…

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC301) SENSORS TRANSDUCERS AND ACTUATORS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To expose to various sensors and transducers for measuring mechanical quantities
- To familiarize with the specifications of sensors and transducers
- To identify for various sensors and transducers for various applications
- To expose to various actuators

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Familiarize with classification and characteristics of various sensors and transducers

CO-2: Familiarize with the principle and working of various sensors and transducers

CO-3: Familiarize with the principle and working of various actuators

CO-4: Select proper transducer / sensor for a specific measurement application

CO-5: Select proper actuator for a specific measurement application

UNIT-I:

Primary Sensing Elements and Transducers: Mechanical devices as primary detectors, mechanical spring devices, pressure sensitive primary devices, flow rate sensing elements, Transducers-electrical Transducers, classification of Transducers, characteristics and choice of Transducers, factors influencing the choice of Transducers.

UNIT-II:

Electric Transducers: Resistive transducers, Potentiometers, Strain gauges, Types of Strain gauges, Resistance thermometers, Thermistors, Thermocouples, variable Inductance Transducers, Linear Variable Differential Transformer, Synchros, Resolvers, Capacitive Transducers, Piezo electric Transducers.

UNIT-III:

Magnetic & Optical Transducers: Hall Effect Transducers, Magneto resistors, Magneto-Elastic and Magneto-Strictive Transducers, Opto electronic Transducers, Digital Encoding Transducers, Photo Optic Transducers.

UNIT-IV:

Smart Sensors & Applications: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication, Standards for Smart Sensor Interface, the Automation.

Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.

UNIT-V:

Pneumatic and Hydraulic Actuators: Pneumatic and Hydraulic Actuation Systems-Actuation systems, Pneumatic and hydraulic systems, Rotary actuators.

Mechanical and Electrical Actuators: Mechanical Actuation Systems-Types of motion, Kinematic chains, Cams, Gears, Ratchet and pawl, Belt and chain drives, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

TEXT BOOKS:

1. A Course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, Puneet Sawhney,19th Edition, 2011
2. Sensors and Transducers, D. Patranabis, 2nd Edition, PHI, 2013
3. Mechatronics, W. Bolton, 7th Edition, Pearson Education, 2018

REFERENCE:

1. Sensors and Actuators, Patranabis, 2nd Edition, PHI, 2013

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EC302) INTRODUCTION TO MICROCONTROLLERS AND INTERFACING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Sensors Transducers and Actuators

COURSE OBJECTIVES:
- To familiarize with the fundamental concepts of digital systems
- To understand programming concepts
- To develop simple applications using microcontrollers

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand basic computing concepts
CO-2: Know the architecture and internal peripherals of 8051 microcontroller
CO-3: Develop knowledge for programming 8051 microcontroller
CO-4: Interface peripherals to ATMEGA328 microcontroller
CO-5: Understand the basic principles and techniques of embedded system design

UNIT-I:
Introduction to Computing: Numbering and Coding Systems: Binary, Decimal, Octal, Hexadecimal and conversions, Binary and Hexadecimal Arithmetic, Complements, Binary codes, Alphanumeric codes, Inside the Computer

UNIT-II:
8051 Microcontroller: Microprocessors Vs Microcontrollers, Architecture and Programming Model of 8051, Special Function Register formats, Memory Organization, Timers and Counters- Operating modes, Serial port, Interrupts

UNIT-III:
8051 Programming in C: Data types, software delay generation, Logical operations, Accessing code and data space in 8051, I/O port programming, Timer/counter programming.
Serial IO modes and their programming in C, interrupts programming in C: serial, timer and external interrupts.

UNIT-IV:
Introduction to Arduino: Features of Arduino, Arduino components and IDE, Pin Configuration of ATMEGA328 microcontroller.
Interfacing: Seven Segment Display, Pulse Width Modulation, Analog to Digital Converter, Stepper Motor, Wireless connectivity to Arduino. Case study: From BT To WiFi: Creating WiFi Controlled Arduino Robot Car.

UNIT-V:

Embedded System Design: Embedded system - Definition, Characteristics of embedded computing applications, Design challenges, Requirements, Specification, Architecture design, Designing hardware and software components, system integration, Design example: Model train controller.

TEXT BOOKS:

1. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, 2005
2. Computers as Components: Principles of Embedded Computing System Design, Wayne Wolf, Morgan Kaufmann, 2001

REFERENCES:

1. Digital Design, Morris Mano, PHI, 3rd Edition, 2006
2. The 8051 Microcontroller: Programming, Architecture, Ayala & Gadre, 3rd Edition, Cengage Publications, 2008
3. Embedded Systems: Architecture, Programming and Design, 2nd Edition, Tata McGraw-Hill

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC401) FUNDAMENTALS OF INTERNET OF THINGS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Sensors Transducers and Actuators, Introduction to Microcontrollers and Interfacing

COURSE OBJECTIVES:
- To understand the basics of Internet of Things
- To learn about IOT and M2M
- To understand Cloud of things
- To learn different applications with IoT

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of Internet of Things
CO-2: Understand the IoT, M2M
CO-3: Understand the concepts Cloud of things
CO-4: Apply IOT to different applications in the real world
CO-5: Understand the role of IoT in various domains of Industry

UNIT-I:
Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT-IoT Functional Blocks, IoT Communication Models, IoT Communication API's.

UNIT-II:
IoT enabling Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates.

UNIT-III:
IoT Platforms Design Methodology: Introduction, IoT Design Methodology- Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specifications, Functional view Specification, Operational View Specification, Device & component Integration, Application Development

UNIT-IV:
IoT and M2M: Introduction, M2M, Difference between IoT and M2M – Communication Protocols, Machines in M2M Vs things in IoT, Hardware Vs Software emphasis, Data collection and analysis, applications, SDN and NFV for IoT

UNIT-V:

Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

Domain specific applications of IoT: Applications of IoT– Home, Health, Environment, Energy, Agriculture, Industry and Smart City.

TEXT BOOKS:

1. Internet of Things: A Hands-On Approach, Vijay Madisetti, Arshdeep Bahga, Universities Press, 2015
2. The Internet of Things – Key Applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley, 2012
3. The Internet of Things in the Cloud: A Middleware Perspective, Honbo Zhou, CRC Press, 2012

REFERENCES:

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers, 2013
2. Menno Huisman, Building the Internet of Things, Sara Cordoba, Wimer Hazenberg, BIS Publishers. 2011
3. Designing the Internet of Things, Adrian Mcewen, Hakin Cassimally, John Wiley and Sons, 2015

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EC402) WIRELESS SENSOR NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Sensors Transducers and Actuators, Introduction to Microcontrollers and Interfacing, IoT Protocols and its applications

COURSE OBJECTIVES:
- To expose basic concepts of wireless sensor network technology
- To study medium access control protocols and various issues in a physical layer
- To understand the key routing protocols for sensor networks and their design issues
- To understand sensor management in networks and design requirements

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Appreciate various design issues of wireless sensor networks
CO-2: Understand the fundamentals of wireless sensor networks and its application to critical real time scenarios.
CO-3: Understand the hardware details of different types of sensors and select the application specific sensor
CO-4: Understand radio standards and communication protocols to be used for wireless sensor networks

UNIT-I:
Introduction: Overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.

UNIT-II:
Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): TinyOS, MANTIS, Contiki, and RetOS.

UNIT-III:
Programming Tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet, NetSim)

UNIT-IV:
Overview of Sensor Network Protocols (Details of at least 2 important protocol per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi- hop and cluster-based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

UNIT-V:

Data Dissemination and Processing: Differences compared with other database management systems, Query models, In-network data aggregation, data storage; query processing.

Specialized Features: Energy preservation and efficiency; security challenges; Fault tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in wireless sensor network.

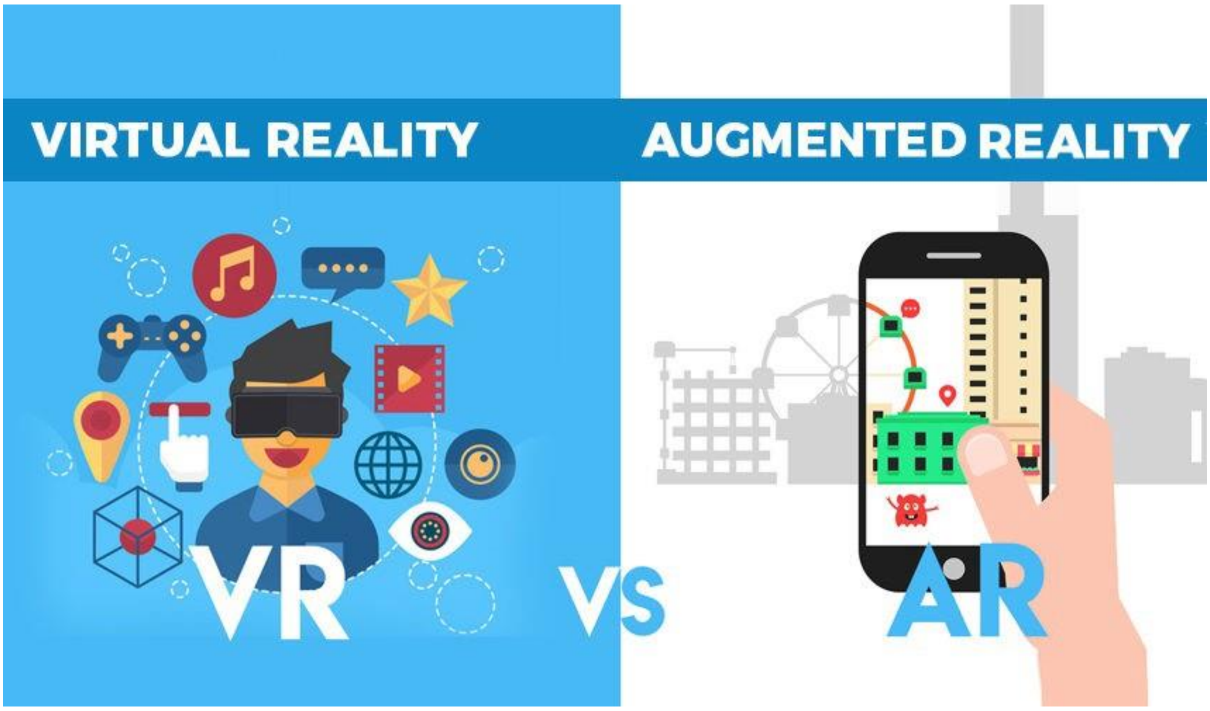
TEXT BOOKS:

1. Wireless Sensor Networks Technology, Protocols, and Applications, Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons, 2007
2. Protocols and Architectures for Wireless Sensor Networks, H. Karl and A. Willig, John Wiley & Sons, India, 2012
3. Wireless Sensor Networks, C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, 1st Indian Reprint, Springer Verlag, 2010

REFERENCES:

1. Wireless Sensor Networks: An Information Processing Approach, F. Zhao and L. Guibas, Morgan Kaufmann, 1st Indian Reprint, 2013
2. Wireless Sensor Network and Applications, Yingshu Li, My T. Thai, Weili Wu, Springer Series on Signals and Communication Technology, 2008
3. Principles of Mobile Communications, Gordon L. Stuber, 2nd Edition, Springer International, 2001

AUGMENTED REALITY (AR)/VIRTUAL REALITY (VR)



AUGMENTED REALITY (AR)/VIRTUAL REALITY (VR)

Offered by: ELECTRONICS AND COMMUNICATION ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Augmented Reality (AR)/ Virtual Reality (VR)	Introduction to C Sharp	Introduction to Signal Processing	Introduction to Image & Video Processing	Fundamentals of Augmented Reality & Virtual Reality

OE TRACK :: AUGMENTED REALITY (AR) / VIRTUAL REALITY (VR)

Augmented reality (AR) and Virtual Reality (VR) bridge the digital and physical worlds. They allow you to take in information and content visually, in the same way you take in the world. AR dramatically expands the ways our devices can help with everyday activities like searching for information, shopping, and expressing yourself. VR lets you experience what it's like to go anywhere from the front row of a concert to distant planets in outer space.

Job Roles in Augmented reality and virtual reality (AR & VR) Track

- Design Architect. ...
- Software Designer. ...
- System Validation Engineers. ...
- Software Developer. ...
- 3D Artist…

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC303) INTRODUCTION TO SIGNAL PROCESSING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand various fundamental characteristics of signals and systems
- To analyze signals in frequency domain
- To know principles of signal transmission through systems
- To understand fundamentals of digital signal

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Classify and analyze signals and Systems
CO-2: Convert the signals from continuous-time to discrete-time
CO-3: Transform signals from one-domain to another domain
CO-4: Apply the transformation tools on signals and systems and analyze their significance and applications
CO-5: Design the structures of different types of digital filters

UNIT-I:
Representation of Signals: Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, causal and non-causal signals, complex exponential and sinusoidal signals. Concepts of standard signals. Various operations on Signals.

UNIT-II:
Representation of Systems: Classification of discrete time Systems, impulse response, Concept of convolution in time domain and frequency domain, response of a linear system, System function, Signal bandwidth, system bandwidth. Ideal filter characteristics.

UNIT-III:
Sampling Theorem: Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a Signal from its samples, aliasing
Z –Transform: Basic principles of z-transform, region of convergence, properties of ROC, Inverse z-transform using Partial fraction.

UNIT-IV:
Introduction to Digital Signal Processing: Applications of Z-Transforms- Solution of Linear Constant Coefficient Difference equations (LCCD), System function, Frequency Response of the system.
Discrete Fourier Transforms: Circular convolution, Comparison between linear and circular convolution, Computation of DFT.

UNIT-V:

IIR Digital Filters: Design of IIR Digital filters (H(s) to be given) - Impulse invariance transformation techniques, Bilinear transformation method**.**

FIR Digital Filters: Characteristics of linear phase FIR filters and its frequency response, Comparison of IIR and FIR filters. Design of FIR filters using Fourier Method and Windowing Technique (only Hanning).

Realization of IIR and FIR Filters: Direct and Cascade forms.

TEXT BOOKS:

1. Signals, Systems and Communications, B.P. Lathi, BS Publications, 2009
2. Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, 2nd Edition, PHI
3. Digital Signal Processing: Principles, Algorithms and Applications, John G. Proakis, D. G. Manolakis, 4th Edition, Perason/PHI, 2009

REFERENCES:

1. Signals and Systems, Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley
2. Signals, Systems and Transforms, C. L. Philips, J. M. Parr and Eve A. Riskin, 3rd Edition, Pearson, 2004
3. Signals and Systems, Schaum's Outlines, Hwei P. Hsu, Tata McGraw-Hill, 2004
4. Digital Signal Processing – A Practical Approach, Emmanuel C. Ifeacher, Barrie W. Jervis, 2nd Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EC304) INTRODUCTION TO IMAGE AND VIDEO PROCESSING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Introduction to Signal Processing

COURSE OBJECTIVES:
- To introduce fundamentals of digital image and video processing
- To demonstrate digital signal processing techniques in spatial and frequency domains
- To study and compare various image and video compression algorithms
- To study applications of motion estimation in video processing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Acquire, represent the digital image and transforms
CO-2: Apply various pixel position and intensity-based image processing techniques
CO-3: Understand and analyze the performance of block matching algorithms in MPEG video coding standards

UNIT-I:
Fundamentals of Image Processing and Image Transforms: Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels, 2 – D Discrete Fourier Transform, Discrete Cosine Transform, Introduction to Wavelet transforms

UNIT-II:
Image Enhancement-Spatial Domain Methods: Point Processing, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters.

UNIT-III:
Image Enhancement-Frequency Domain Methods: Basics of filtering in frequency domain, Image Smoothing, Image Sharpening, Selective Filtering.
Image Segmentation: Segmentation Concepts, Point, Line and Edge Detection, Thresholding, Region Based Segmentation.

UNIT-IV:
Image Compression: Image compression fundamentals – coding Redundancy, spatial and temporal redundancy.
Compression Models: Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding.

UNIT-V:

Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models: 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals.

2-D Motion Estimation: Optical flow, pixel-based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Application of motion estimation in video coding.

TEXT BOOKS:

1. Digital Image Processing, Gonzaleze and Woods, 3rd Edition, Pearson
2. Video Processing and Communication, Yao Wang, Joem Ostarmann and Ya – Quin Zhang, 1st Edition, PHI

REFERENCES:

1. Digital Video Processing, M. Tekalp, Prentice Hall International
2. Image Acquisition and Processing with LabVIEW, Relf, Christopher G., CRC Press
3. Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms, Aner Ozdemi R, John Wiley & Sons
4. Fundamentals of Digital Image Processing, A Practical Approach with Examples in Matlab, Chris Solomon, Toby Breckon, John Wiley & Sons

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC403) FUNDAMENTALS OF AUGMENTED REALITY AND VIRTUAL REALITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Introduction to Signal Processing, Introduction to Image & Video Processing

COURSE OBJECTIVES:
- To review current Virtual Reality (VR) and Augmented Reality (AR) technologies
- To learn the fundamentals of VR/AR modeling and programming
- To provide a detailed analysis of engineering scientific and functional aspects of VR/AR

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Acquire knowledge in main applications VR / AR technologies
CO-2: Analyze different tools for VR/AR applications
CO-3: Develop VR/AR applications

UNIT-I:
Augmented Reality and Virtual Reality
Augmented Reality: Introduction to Augmented Reality (AR), Fundamentals, Chronicle order of AR, features
Virtual Reality: Introduction to Virtual Reality (VR), Features of VR and Chronicle order of VR; Difference between AR and VR.

UNIT-II:
Types of Augmented Reality: Marker based AR, Marker less AR, Projection based AR, Super Imposition based AR, Applications of AR.

UNIT-III:
Types of Virtual Reality: Non- immersive simulation, Semi-immersive simulations, Fully immersive simulations; Applications VR.

UNIT-IV:
Making an AR App with Simple CUBE: Introduction to Unity, Installation steps, Fundamentals while implementing Project, importing a cube, Create an account in Vuforia, license manager, target manager, downloading database and uploading target database in unity.

UNIT-V:
AR App with Interaction: Introduction to C#, Scripting interactive objects, implementation C# Script using unity, uploading target object, deploying application into ANDROID Device.

Creating an Virtual Reality: Creating an Virtual Reality Scene in unity, adding colliders, Settings of Unity to make the application compatible with Google cardboard.

TEXT BOOKS:

1. Augmented Reality for Developers: Build Practical Augmented Reality Applications with Unity, AR Core, AR Kit, and Vuforia, Linowes J., Babilinski K., Packt Publishing, 2017
2. Building Virtual Reality with Unity and Steam VR, Murray J. W., CRC Press, 2020

REFERENCES:

1. Virtual Reality & Augmented Reality in Industry, Ma D., Gausemeier J., Fan X., Grafe M. (Eds.), Springer, 2011
2. Unity 2020 Virtual Reality Projects: Learn VR Development by Building Immersive Applications and Games with Unity 2019.4 and Later Versions, Linowes J., 3rd Edition, Packt Publishing, 2020

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC404) INTRODUCTION TO METAVERSE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To examine the role of architecture and design in the making of the metaverse
- To discuss the potential and future of the design disciplines in the metaverse era
- To explore metaverse constituent elements and their relation to virtual environments
- To demonstrate key design concepts, theories and industry practices applicable to creating spaces for the metaverse
- To explain voxel graphics, polygon graphics and gaming development environments and utilize them to create 3d content for the metaverse

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate a comprehensive understanding of Metaverse and Architecture
CO-2: Use key tools and workflows needed for creating designs in Metaverse
CO-3: Explain Metaverse design principles
CO-4: Create designs in Metaverse, including voxel and polygon pipelines, virtual materiality, interactivity, and animations

UNIT-I:
Introduction: Introduction to Metaverse and Architecture, Precedents, Gateways- Uses and Activities (Museums, Galleries, Event Spaces, etc.), Key Centralized Platforms, Key Decentralized Platforms, Architectural Metaverse Case Studies.

UNIT-II:
Pillars: User Interfaces and Immersion, Avatars and Identities (Avatar builders), Economy (Currencies, Wallets, Marketplace's, NFTs, Play-to-Earn), Land (Parcels, Mapping and Cartography), Assets (Digital Twins, Urban Scales, Communities, Landmarks), Artificial Intelligence.
Designing for the Metaverse: Narrative and Storytelling, User Experience/Perception/ Interaction, Systems Design and Interoperability, Lessons from other disciplines (Programming, Gaming, etc), Design Rules and Constraints (Gravity, Navigation, etc), Aesthetics of the Metaverse

UNIT-III:
Tools and Workflows: 3D Modelling Software (Blender, Rhino), Gaming Engines and Templates (Unity, Unreal), Native Platform Builders, Predominant File Types (*.vox, *.glb, *.gltf), Computer Graphics (Polygonal and Voxel Graphics), Textures / Transformations

/ Meshes (vertices, edges, faces), Optimising and Exporting 3D Models (constrains/limitations/considerations)
Voxel Pipeline: Voxel Graphics and Applications, Tools, and UIs (Overview, Navigation, Uses, etc), Basic Voxel Modelling and Editing, Workflow Example (Blender or Rhino to Sandbox or CryptoVoxels), Assets and Colliders

UNIT-IV:
Polygon Pipeline: Polygon Graphics and applications, Tools and UIs (Overview, Navigation, Uses, etc), Basic Polygon Modelling and Editing, Workflow Example (Blender or Rhino to Decentraland), Assets and Colliders.
Game Engines Pipeline: Tools and UIs (Overview, Navigation, Uses, etc), Unity SDK Templates, Workflow Example (Unity or Unreal to MONA), Assets and Colliders.

UNIT-V:
Virtual Materiality: Standard and Physically based rendering (PBR) Materials, Shaders (diffuse, specular, transparency, emissiveness, etc.), Textures, Lights.
Interactivity and Animations: Interactivity (Adding Media, Audio, Links, NFTs), Animations (Creating and Testing), SDK Intro – Create by writing code.

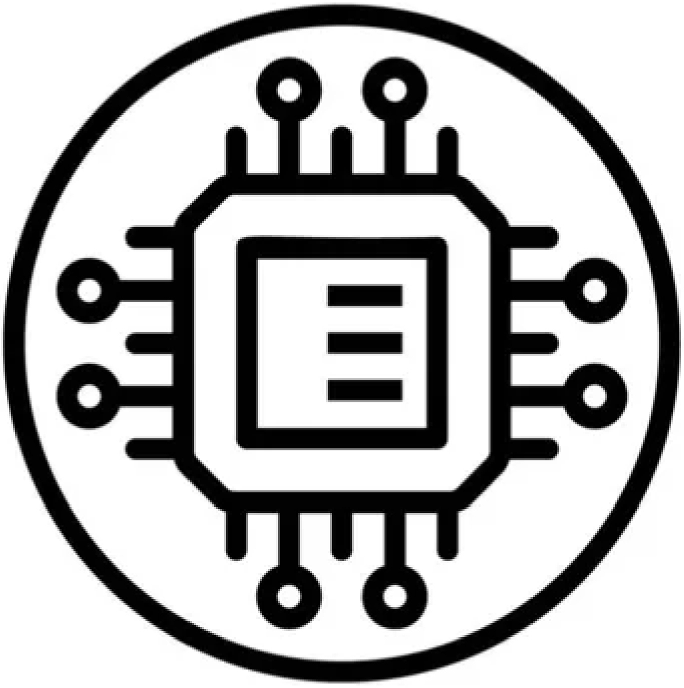
TEXT BOOKS:

1. The Metaverse Primer, Ball M., 2021
2. Designing the Metaverse, Chen H., 2021
3. Architecting the Metaverse, Chen C., 2021

REFERENCES:

1. Why Architecture Matters in the Metaverse, Cowdrey R., 2021
2. Avatars: Exploring and Building Virtual Worlds on the Internet, Damer B., Peachpit P., 1997
3. Virtual Cities: An Atlas & Exploration of Video Game Cities, Dimopoulos K., 1st Edition, Countryman Press, 2020
4. The Geographies of Cyberspace, Dodge M., Working Paper Series, CASA, UCL, 1999
5. Introduction to Computer Graphics, Eck D. J., Hobart and W. S. Colleges, 2016

MICROELECTRONICS



MICROELECTRONICS

Offered by: **ELECTRONICS AND COMMUNICATION ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Augmented Reality (AR)/ Virtual Reality (VR)	Principles of Microelectronics	Programmable Logic Devices for Microelectronics	Fundamentals of Physical Design For VLSI	Recent Trends in Microelectronics

MICROELECTRONICS

The microelectronics open elective track covers various aspects of microelectronics and Very Large Scale Integration (VLSI) design.

Principles of Microelectronics course covers the fundamental principles and concepts of microelectronics, including digital electronics, electronic devices and basic circuit design.

Programmable Logic Devices for Microelectronics course focuses on the design and application of programmable logic devices (PLDs) in microelectronics, emphasizing Field Programmable Gate Arrays (FPGAs) and Complex Programmable Logic Devices (CPLDs).

Fundamentals of Physical Design for VLSI course covers the physical design process in VLSI, including placement, routing, and design rules.

Recent Trends in Microelectronics course explores the latest advancements and emerging trends in the field of microelectronics like nanotechnology, Micro-Electro-Mechanical Systems (MEMS), 3D ICs etc,

These courses collectively provide a comprehensive understanding of microelectronics and VLSI design, equipping students with the knowledge and skills to tackle contemporary challenges and innovations in the field.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC305) PRINCIPLES OF MICROELECTRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the concepts of diode and BJT
- To study the fundamentals of combinational circuits
- To learn electrical properties of MOS transistors
- To learn the basic principles of VLSI and fabrication steps
- To know the design of digital circuits using MOS logic

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Acquire knowledge of PN Junction diode and BJT
CO-2: Realize combinational logic circuits using Boolean algebra and Karnaugh maps
CO-3: Interpret the electrical properties of MOS transistors
CO-4: Understand the fabrication steps of integrated circuits
CO-5: Realize Boolean expressions using MOS logic

UNIT-I:
Electronic Devices: PN junction diode and its operation, V-I characteristics of PN Junction Diode, Operation of Half wave and full wave rectifiers. BJT structure and operation, BJT configurations.

UNIT-II:
Digital Fundamentals: Types of number representations and conversions, Boolean Algebra, Canonical and Standard forms, Karnaugh maps (Three and Four Variables, Digital Logic gates, realization of Boolean functions, NAND and NOR implementations.

UNIT-III:
Basic Electrical Properties of MOS Transistors: MOSFET types, MOSFET structure and operation, I-V characteristics of MOSFETs, IDS versus VDS relationship, MOS transistor threshold voltage, Transconductance and Output conductance (Qualitative analysis only).

UNIT-IV:
Microelectronics: Introduction to Microelectronics and Integrated Circuit Technology, Evolution of Integrated Circuits, Moore's Law, VLSI design flow, NMOS, PMOS and CMOS fabrication steps.

UNIT-V:
MOS Logic Circuits: CMOS Inverter, CMOS logic gates design, Realizing Boolean expressions using NMOS and CMOS logic, Pass transistor logic, CMOS transmission gates.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Dougles and A. Pucknell, PHI, 2005
2. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky
3. Digital Design, M. Morris Mano, 3rd Edition, Pearson Education/PHI, 2003

REFERENCES:

1. CMOS Digital Integrated Circuits Analysis and Design, Sung-Mo Kang, Yusuf Leblebici, , 3rd Edition, Tata McGraw-Hill, 2011
2. CMOS VLSI design: A Circuits and Systems Perspective, N. H. E. Weste and D. M. Harris, 4th Edition, Pearson Education, 2011
3. The Design and Analysis of VLSI Circuits, L. Glaser and D. Dobberpuhl, Addison Wesley, 1985

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EC306) PROGRAMMABLE LOGIC DEVICES FOR MICROELECTRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Microelectronics

COURSE OBJECTIVES:
- To introduce digital design concepts of combinational and sequential circuits
- To learn digital design concepts through Programmable Logic Devices
- To understand the design flow of digital circuits
- To learn physical design steps of FPGA
- To know the architectures of CPLD and FPGAs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basics of digital circuits
CO-2: Realize digital circuits using PLDs
CO-3: Simulate and synthesize digital circuits
CO-4: Analyze physical design flow of FPGA
CO-5: Implement digital circuits using PLDs

UNIT-I:
Digital Design: Binary adders and subtractors, multiplexers, demultiplexers, Realization of logic expressions using Multiplexers, decoders, encoders, Latches and flip-flops, shift registers, synchronous binary counter and Up-Down Counter (Qualitative analysis only).

UNIT-II:
Programmable Logic Devices: Classification of memories, PROM, Programmable Logic Arrays and Programmable Array Logic.

UNIT-III:
Simulation and Synthesis: Simulation, Simulation types, Synthesis, Synthesis Methodologies, Translation, Mapping, Optimization.
Introduction to FPGA: Features and Applications of FPGAs, Advantages of FPGA, General Architecture of FPGA, Programming Technologies.

UNIT-IV:
Physical Design Flow of FPGAs: FPGA Design flow, Physical Design cycle for FPGAs, Partitioning, placement, Segmented and Non-Segmented Routing techniques.

UNIT-V:

CPLD and FPGA Architectures: CPLD architecture- Altera series – Max 7000, General Design Issues, Commercially Available FPGAs, XILINX FPGA- Artix-7, Actel ACT1, ACT2 and ACT3 FPGA architectures.

Case Study: Full adder implementation using FPGA.

TEXT BOOKS:

1. Modern Digital Electronics, R. P. Jain, 4th Edition, Tata McGraw-Hill, 2009
2. Digital Design, M. Morris Mano, 3rd Edition, Pearson Education/PHI
3. Application Specific Integrated Circuits, M. J. S. Smith, Pearson Education, 2004

REFERENCES:

1. Field-Programmable Gate Arrays, Stephen D. Brown, Springer, 1992
2. Algorithms for VLSI Physical Design Automation, Naveed Sherwani, 3rd Edition, Springer International, 2005
3. Field Programmable Gate Array Technology, Stephen M. Trimberger, Springer International, 1994

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EC405) FUNDAMENTALS OF PHYSICAL DESIGN FOR VLSI

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Microelectronics

COURSE OBJECTIVES:
- To know VLSI physical design automation
- To learn concepts related to physical design like floor planning, partitioning and placement
- To learn concepts related to physical design like routing and different routing techniques and compaction algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Learn the automation process for VLSI system design
CO-2: Understanding of fundamentals for various physical design CAD tools
CO-3: Develop and enhance the existing algorithms and computational techniques for physical design process of VLSI systems
CO-4: Design the systems using
CO-5: Understanding of various routing process and algorithms

UNIT-I:
Introduction to Physical Design: VLSI Design Cycle, New Trends in VLSI Design Cycle - Design Representation- Y- Chart, VLSI Design Styles - Full-Custom, Standard Cell, Gate Arrays, Field Programmable Gate Arrays Sea of Gates.

UNIT-II:
System Packaging Styles: Die Packaging and Attachment Styles, Die Package Styles, Package and Die Attachment Styles, Printed Circuit Boards, Multichip Modules, Wafer Scale Integration, Comparison of Different Packaging Styles.

UNIT-III:
Partitioning: Introduction, constraints and objectives of the partitioning process - System Level Partitioning, Board Level Partitioning, Chip Level Partitioning, Problem Formulation, Classification of Partitioning Algorithms.

UNIT-IV:
Floor Planning: Introduction, Factors to be considered for floor planning, Problem Formulation, Classification of Floor planning Algorithms. Introduction to Pin Assignment and placement.

UNIT-V:

Global Routing: Introduction to Global Routing, general routing problem, objective of the routing problem, Problem Formulation- Grid Graph Model, Checker Board Model, Channel Intersection Graph Model, Classification of Global Routing Algorithms.

Detailed Routing: Introduction to detailed Routing, Routing Considerations, Routing Models, Channel Routing Problems, Switchbox Routing Problems.

TEXT BOOKS:

1. Algorithms for VLSI Physical Design Automation, Naveed Sherwani, 3rd Edition, 2005
2. Algorithms for VLSI Design Automation, S. H. Gerez, Wiley Student Edition, John Wiley & Sons, 1999
3. VLSI Physical Design Automation, Sait Sadiq M., IEEE, Institute of Electrical & Electronics Engineers, 1995

REFERENCES:

1. Computer Aided Logical Design with Emphasis on VLSI, Hill & Peterson, Wiley, 1993
2. Modern VLSI Design: Systems on Silicon, Wayne Wolf, 2nd Edition, Pearson Education Asia, 1998
3. Physical Design Automation of VLSI Systems, Bryan Lorenzetti, Michael T.
4. CMOS VLSI Design: A Circuits and Systems Perspective, Weste Neil H. E., Harris, David, 2004
5. Digital VLSI Design, Ajay Kumar Singh, PHI Learning, 2011

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EC406) RECENT TRENDS IN MICROELECTRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the concepts of semiconductor devices
- To study the fundamental digital design
- To learn the basic principles of VLSI and fabrication process
- To learn the electrical properties of MOS transistors
- To gain the knowledge about MOS designs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the concepts of PN Junction diode to design an application
CO-2: Apply the concepts of MOSFET by considering its practical design constraints to solve digital design applications
CO-3: Acquire a knowledge on fabrication process of integrated circuits
CO-4: Analyse the electrical properties of MOS transistors
CO-5: Design Combinational circuits using different logic style

UNIT-I:
Introduction to Verilog: Introduction, chip design flow, Verilog syntax, data types, constant, parameters, Continuous assignment, Procedural assignment, Operator types, Functions, Tasks.

UNIT-II:
Verilog modelling: Gate level modelling, behavioural modelling Conditional statements, looping, dataflow modelling. Design of basic gates using three modelling techniques

UNIT-III:
Introduction to System Verilog: Introduction, testbench, functional verification approaches, role of verification plan, design for verification, code coverage

UNIT-IV:
System Verilog Coding Guidelines: Literal values, data types, data declaration, packed/unpacked arrays, dynamic/associative arrays, operators, procedural statements, classes.

UNIT-V:
Scripting Languages of VLSI: Linux architecture, shells, files and directories, file system, system calls for the file I/O operations, file permissions & ownership, basic Linux commands, grep. SED, AWK.

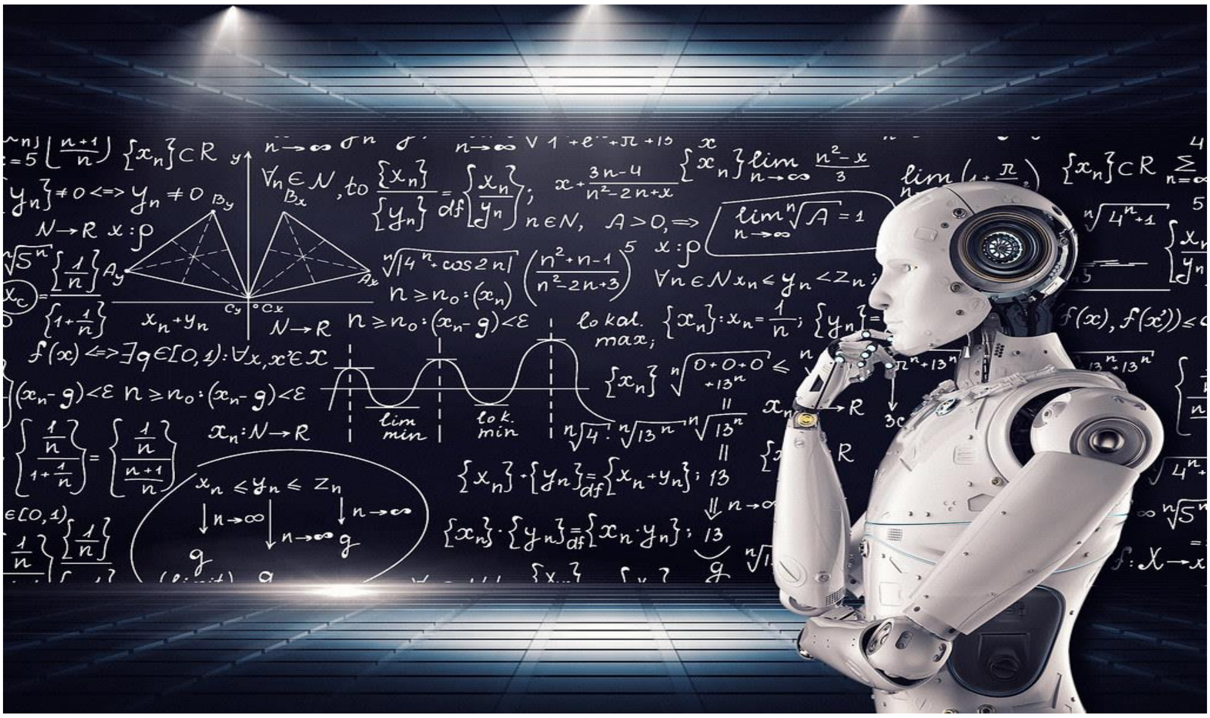
TEXT BOOKS:

1. Verilog HDL Synthesis: A Practical Primer, Bhasker J., Star Galaxy Publishing, 1998
2. Verilog HDL: A Guide To Digital Design and Synthesis (Vol. 1), Palnitkar S., Prentice Hall Professional, 2003
3. Writing Testbenches using System Verilog, Bergeron J., Springer Science & Business Media, 2007

REFERENCES:

1. System Verilog for Design: A Guide to Using System Verilog for Hardware Design and Modeling, Stuart Sutherland, Simon Davidmann, Peter Flake, 2nd Edition, Springer, 2006
2. Linux: The Complete Reference, Petersen R., McGraw-Hill, 2007
3. Operating System Concepts and Basic Linux Commands, Shital V. G., 2011

ARTIFICIAL INTELLIGENCE



ARTIFICIAL INTELLIGENCE

Offered by: **COMPUTER SCIENCE AND ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Artificial Intelligence	Mathematics for Artificial Intelligence	Fundamentals of Artificial Intelligence	Machine Learning Techniques	Deep Learning

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is a cognitive science with highly research activities in the major areas like Machine Learning, Robotics, Natural Language Processing and image processing. This track will cover basic foundations of artificial intelligence it will make the students industry-ready for artificial intelligence and data science job roles. Artificial intelligence is used in wide range of industrial applications such as healthcare, transportation, entertainment, insurance, transport and logistics, and customer service.

Future applications of AI would be utilized in automated transportation, cyborg technology, solving problems associated with climate change, deep-sea and space exploration.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT301) APPLIED MATHEMATICS IN ARTIFICIAL INTELLIGENCE
(CE, ME & AE**)**

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge of Probability, Regression and Calculus

COURSE OBJECTIVES:
- To learn multi-dimensional generalization of a univariate normal random variable
- To learn concept of multivariable linear regression model
- To apply knowledge of vectors, inner products, and linear transformations for solving real world situations
- To construct mathematical models for solving real-world problems
- To understand optimization techniques like convex and constrained optimization

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Model the linear relationship between the explanatory (independent) Variables and response(dependent)variables
CO-2: Make better decisions using linear regression techniques
CO-3: Recognize and use basic properties of subspaces and vector spaces
CO-4: Identify the use of matrix theory to solve the system of linear equations and apply in various engineering problems
CO-5: Analyze and solve the complexity of a given problem with suitable optimization techniques

UNIT–I:
Multivariate Normal Distribution & Linear Regression Model: Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Standard multiple regression models with emphasis on detection of collinearity, outliers.

UNIT–II:
Multivariate Regression: Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance

UNIT-III:
Vector Space: Orthogonal vectors, normal and orthonormal vectors, linear combination, linear span, linear independence of vectors, Vector space; Subspace, Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.

UNIT-IV:

Applications of Matrices: Solution of Tri-diagonal system of equations using LU decomposition Method; Applications of linear systems- Network Flows and Mechanical Systems.

Review of eigen values and eigen vectors, intuition, significance, Principal component analysis-concept, properties, applications, Singular value decomposition-concept, properties, applications

UNIT-V:

Multivariate Calculus: Review of gradient and its properties. Hessian, Gradient of vector valued function, Gradient of matrices. Local/global maxima and minima, convex sets, convex functions, gradient descent algorithms- Learning rate, momentum, stochastic. Constrained optimization (Lagrange Multiplier method), convex optimization.

TEXT BOOKS:

1. An introduction to Multivariate Statistical Analysis, T. W. Anderson
2. Mathematics for Machine Learning, Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Cambridge University Press., 2020
3. Linear Algebra and it's Applications, David C. Lay, 3rd Edition, Pearson

REFERENCES:

1. Math for Machine Learning: Open Doors to Data Science and Artificial Intelligence, Richard Han, 2018
2. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, James V. Stone
3. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT302) MATHEMATICS FOR ARTIFICIAL INTELLIGENCE
(EEE & EIE**)**

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Permutations, Combinations, Differentiation & Integration

COURSE OBJECTIVES:
- To understand elementary ideas in basic probability, distribution functions
- To demonstrate various statistical methods and linear relationship between the given variables
- To apply knowledge of vectors, inner products, and linear transformations for solving real world situations
- To construct mathematical models for solving real-world problems
- To understand optimization techniques like convex and constrained optimization

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explore and demonstrate practical approaches related to implementation of the AI algorithms using probability concepts and distributions
CO-2: Use and fit a linear regression model to data and use it for prediction
CO-3: Recognize and use basic properties of subspaces and vector spaces
CO-4: Identify the use of matrix theory to solve the system of linear equations and apply in various engineering problems
CO-5: Analyze and solve the complexity of a given problem with suitable optimization techniques

UNIT–I:
Probability: Basic rules and axioms, events, sample space, frequentist approach, dependent and independent events, conditional probability, Random variables, continuous and discrete, expectation, variance, distributions- joint and conditional, Bayes' Theorem, Popular distributions- Bernoulli, binomial, Poisson, Normal.

UNIT–II:
Descriptive Statistics & Linear Regression: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - Central tendency and Dispersion. Bivariate data, Summarization, marginal and conditional distribution. Correlation and Regression, Simple Linear Regression Models.

UNIT-III:
Vector Space: Orthogonal vectors, normal and orthonormal vectors, linear combination, linear span, linear independence of vectors, Vector space; Subspace, Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.

UNIT-IV:

Applications of Matrices: Solution of Tri-diagonal system of equations using LU decomposition Method; Applications of linear systems- Network Flows and Mechanical Systems.

Review of eigen values and eigen vectors, intuition, significance, Principal component analysis-concept, properties, applications, Singular value decomposition-concept, properties, applications

UNIT-V:

Multivariate Calculus: Review of gradient and its properties. Hessian, Gradient of vector valued function, Gradient of matrices. Local/global maxima and minima, convex sets, convex functions, gradient descent algorithms- Learning rate, momentum, stochastic. Constrained optimization (Lagrange Multiplier method), convex optimization.

TEXT BOOKS:

1. Mathematics for Machine Learning, Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Cambridge University Press., 2020
2. Linear Algebra and it's Applications, David C. Lay, 3rd Edition, Pearson Publications
3. Probability and Statistics for Engineers, Richard A. Johanson, 5th Edition, Prentice-Hall, 1995

REFERENCES:

1. Math for Machine Learning: Open Doors to Data Science and Artificial Intelligence, Richard Han, 2018
2. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, James V. Stone
3. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1CS303) FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence

COURSE OBJECTIVES:
- To understand and analyze the importance and basic concepts of artificial intelligence and the use of agents
- To identify, explore the complex problem-solving strategies and approaches
- To analyze the concepts of basic concepts of neural networks and learning process
- To explore and analyze the methodology used in machine learning

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basic concepts of artificial intelligence and the use of agents into the real-world scenario
CO-2: Design and formulate complex problem solutions with the use of various searching techniques
CO-3: Estimate the skill for representing knowledge using the appropriate technique for a given problem
CO-4: Apply AI techniques to solve problems of game playing, and machine learning

UNIT-I:
Introduction to AI: Foundations of AI – History of AI - Applications of AI, Intelligent Agents – Agents and Environments – Nature of Environments – Structure of Agents – Problem solving Agents – Problem formulation – Example Problems.

UNIT-II:
Searching Techniques: Uninformed Search Strategies – Breadth first search – Depth first search – Depth limited search - Bidirectional search – comparison – Search with partial information - Heuristic search – Greedy best first search – A* search – Memory bounded heuristic search - Heuristic functions - Local search- Hill climbing – Simulated annealing search - Local beam search, Genetic algorithms.

UNIT-III:
Constraint Satisfaction Problems: Backtracking search for CSP's - local search for constraint satisfaction problem. Adversarial search – Games - Minimax algorithm, Alpha beta pruning, cutting-off search.

UNIT-IV:
Knowledge Representation and Reasoning: Propositional Logic, Rules of Inference, First Order Logic (FOL) Syntax, Semantics, Entailment.

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT-V:

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2010
2. Machine Learning, Tom M. Mitchell, McGraw-Hill
3. Neural Networks A Comprehensive Foundation, Simon Haykin, 2nd Edition, Pearson Education, 2004

REFERENCES:

1. Artificial Intelligence, Elaine Rich & Kevin Knight, 2nd Edition, Tata McGraw-Hill
2. Artificial Intelligence-A New Synthesis, Nils J. Nilsson, Elsevier
3. Artificial Neural Networks, Yegnanarayana B., PHI

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CS401) MACHINE LEARNING TECHNIQUES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence, Fundamentals of Artificial Intelligence

COURSE OBJECTIVES:
- To understand applications in computational learning theory
- To analyse the pattern comparison techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and Familiarize the basics concept, notations used in machine learning and mathematics behind machine learning algorithms
CO-2: Demonstrate different types of machine learning algorithms
CO-3: Apply the suitable machine learning techniques and construct a machine learning model to solve real world applications
CO-4: Evaluate model accuracy and familiarize with advanced learning algorithms

UNIT-I:
Introduction to Machine Learning: Perspectives and issues in machine learning, Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.
Regression: Regression types, gradient descent; features of Over fitting and complexity; training, validation, test data, Logistic regression and applications.

UNIT-II:
Supervised Learning: Classification, decision boundaries; nearest neighbor methods, Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, Linear classifiers Bayes' Rule and Naive Baye's classification.
Instance-Based Learning: Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT-III:
Unsupervised Learning: Clustering, k-means, hierarchical, partition-based clustering, overlapping clustering, Support vector machines, Support vector regression.

UNIT-IV:
Reinforcement Learning: Introduction to Reinforcement learning, the learning task, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT-V:

Neural Networks: Introduction to neural networks, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and Convolution neural networks.

TEXT BOOKS:

1. Machine Learning, Tom M. Mitchell, McGraw-Hill
2. Neural Networks and Learning Machines, S. Haykin, Pearson, 2008

REFERENCES:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
2. Machine Learning: The Art and Science of Algorithms that make Sense of Data, Peter Flash, Cambridge, University Press
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MIT Press, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1CS402) DEEP LEARNING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Mathematics for Artificial Intelligence, Fundamentals of Artificial Intelligence, Machine Learning Techniques

COURSE OBJECTIVES:
- To introduce the foundations of deep learning
- To acquire the knowledge on deep learning concepts

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify and select appropriate learning network models required for real world problems
CO-2: Design an efficient model with various deep learning techniques
CO-3: Implement deep learning algorithms and solve real-world problems
CO-4: Apply optimization strategies necessary for problem solving required for large scale applications

UNIT-I:
Introduction to Deep Learning: History of Deep Learning, Deep Learning Success Stories, Biological Neuron, Idea of computational units, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm and Convergence.

UNIT-II:
Feedforward Networks: Multilayer Perceptron, Gradient Descent, Back-propagation, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks.

UNIT-III:
Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT-IV:
Optimization for Training Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithm.
UNIT-V:

Convolutional Neural Networks: LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Markov Networks, Object Detection, RCNN, Fast RCNN, Faster RCNN, YOLO,Auto-Encoders: Regularization in auto-encoders, De-noising auto-encoders, Sparse auto-encoders, Contractive auto-encoders,

TEXT BOOKS:

1. Deep Learning: An MIT Press Book, Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall

REFERENCES:

1. Neural Networks: A Systematic Introduction, RaÚl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

BLOCKCHAIN TECHNOLOGIES

BLOCKCHAIN TECHNOLOGIES

Offered by: COMPUTER SCIENCE AND ENGINEERING

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Blockchain Technologies	Fundamentals of Computer Networks / Relational Database Management Systems	Distributed Data Bases	Cryptography and Network Security	Blockchain Technology

BLOCKCHAIN TECHNOLOGIES

The blockchain is one of the fastest growing skills in the IT sector today. This track will help the students to gain knowledge in blockchain technology, it has taken quite a turn in the industry given its popularity in providing safe and secured online transactions. Most individuals and organizations have started adopting blockchain because of the many benefits it offers to the industry today. It is used in many industry applications such as banking sector, voting, health care, real estate, the legal industry and government.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS301) FUNDAMENTALS OF COMPUTER NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce the fundamental various types of computer networks
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To explore the various layers of OSI model
- To introduce UDP and TCP models
- To have the concept of different routing techniques for data communications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and explore the basics of computer networks reference models and the functionalities of physical layer
CO-2: Learn major concepts, principles involved in data link layer and network layer
CO-3: Analyze how to maintain QoS in network and maintaining of congestion control
CO-4: Demonstrate the application layer functionalities and importance of security in the network

UNIT-I:
Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.
Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

UNIT-II:
Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT-III:
Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman Ford, Disjkstra's routing protocols, RIP, OSPF, BGP and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT-IV:
Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.
Application Layer: Domain Name Space, DNS in Internet, Electronic Mail.

UNIT-V:
File Transfer Protocol, WWW, HTTP, SNMP, Multimedia.
Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

TEXT BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan, 4th Edition, McGraw-Hill Education, 2006
2. Computer Networks, Andrew S. Tanenbaum, 4th Edition, Pearson Education
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education

REFERENCES:

1. Data Communications and Networks, William Stallings
2. Data Communication and Networks, Bhusan Trivedi, Oxford University Press, 2016
3. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education
4. Understanding Communications and Networks, W. A. Shay, 3rd Edition, Cengage Learning

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS302) RELATIONAL DATABASE MANAGEMENT SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the basic concepts of database systems and design E-R models to represent simple database application scenarios
CO-2: Formulate SQL queries on the data
CO-3: Improve the database design by normalization
CO-4: Apply and relate the concept of transaction, concurrency control and recovery in database
CO-5: Familiar with basic database storage structures and access techniques using Indexing, hashing including B tree methods

UNIT-I:
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.
Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.
Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT-II:
Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT-III:
Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT-IV:
Transaction Management: Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Transaction Isolation Levels, Implementation of Isolation Levels.
Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.
Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT-V:
Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.
Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.
Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:
1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition, McGraw-Hill Education
2. Database System Concepts, A. Silberschatz, Henry F. Korth, S. Sudarshan, 6th Edition, McGraw-Hill Education
3. Database Systems, R. Elmasri, Shamkant B. Navathe, 6th Edition, Pearson Education

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1IT301) CRYPTOGRAPHY AND NETWORK SECURITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases

COURSE OBJECTIVES:
- To outline security concepts, threats, attacks, services and mechanisms
- To describe various cryptosystems- symmetric key cryptography, public key cryptography
- To apply authentication services and secure hash functions
- To discuss the concepts of IP security, web security, viruses and firewalls

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the basics of security attacks, services, goals and mechanism
CO-2: Apply a variety of cryptographic algorithms, hash functions and protocols underlying network security and authentication applications
CO-3: Understand and anlyze the key management requirements and implementation
CO-4: Examine and analyze various email and web security mechanisms
CO-5: Understand the system level security issues

UNIT-I:
Security Attacks: Security Attacks (Active and Passive), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and Availability) and Mechanisms, A model for Internetwork security, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II:
Conventional Encryption: Classical Encryption techniques(Rail fence, Hill Cipher, Caesar cipher, Vigenere cipher, Play Fair Cipher), Fiestel Cipher Structure, Data Encryption Standard, Block Cipher Design Principles and Modes of Operation, Triple DES, RC-4, AES Cipher, Placement of Encryption Function.
Public Key Cryptography and Authentication: Confidentiality using Symmetric Encryption – Principles of Public key Cryptosystems, RSA algorithm,

UNIT-III:
Key Management: Diffie-Hellman key Exchange, Elliptic Curve Cryptography.
Hash Functions: Hash Functions, Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard, Authentication Applications: Kerberos, X.509 Authentication Service

UNIT-IV:

Email Security and Web Security: Electronic Mail Security – PGP/ SMIME, IP security-Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Web Security- Secure Socket Layer, Transport Layer Security and Secure Electronic Transaction

UNIT-V:

System Level Security: Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practices, William Stallings, 4th Edition, Prentice Hall of India, 2005
2. Hack Proofing Your Network, Ryan Russell, Dan Kaminsky, Rain Forest, Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W. Manzuik and Ryan Permeh, Wiley Dreamtech

REFERENCES:

1. Network Security Essentials: Applications and Standards, William Stallings, Prentice Hall, 1999
2. Security in Computing, Charles B. Pfleeger, Shari Lawrence Pfleeger, 3rd Edition, Pearson Education, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1CS403) DISTRIBUTED DATABASES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Database Management Systems, Computer Networks

COURSE OBJECTIVES:
- To introducing distributed database architecture and fragmentation methodologies
- To describe conceptual data models to design and access of fragmented data
- To demonstrate optimized query access strategies
- To enumerate the concepts of distributed transaction processing for reliable data

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze issues related to distributed database design
CO-2: Apply Partitioning techniques to databases
CO-3: Design and develop query processing strategies
CO-4: Describe transaction processing and concurrency control in distributed database
CO-5: Derive reliable recovery techniques

UNIT-I:
Introduction: Features of Distributed versus Centralized Databases,
Levels of Distribution Transparency: Reference Architecture for Distributed Databases, Types of Data Fragmentation, Distribution transparency for Read – only Applications, Distribution transparency for update Applications, Distributed database Access primitives, Integrity Constraints in Distributed Databases.

UNIT-II:
Distributed Database Design: A framework, the design of database fragmentation, the allocation of fragments.
Translation of Global Queries to Fragment Queries: Equivalence Transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

UNIT-III:
Query Optimization: Framework for Query Optimization, Join Queries, General Queries.
Management of Distributed Transactions: A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural aspects of Distributed Transactions

UNIT-IV:

Concurrency Control:

Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT-V:

Reliability:

Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart.

TEXT BOOKS:

1. Principles of Distributed Database Systems, M. Tamer OZSU and Patuck Valduriez,
2. Pearson Education Asia, 2001
3. Distributed Databases, Stefano Ceri and Willipse Pelagatti, McGraw-Hill

REFERENCES:

1. Database System Concepts, Henry F. Korth, A. Silberchatz and Sudershan, McGraw-Hill
2. Database Management Systems, Raghuramakrishnan and Johhanes Gehrke, McGraw-Hill

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1CS404) BLOCKCHAIN TECHNOLOGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases, Cryptography and Network Security

COURSE OBJECTIVES:
- To get the terminologies and overview of blockchain technologies
- To study the concepts and foundation of blockchain technology
- To understand security mechanism and consensus in blockchain
- To design use cases and architecture blockchain technology

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the basic concepts and characteristics of Blockchain technology
CO-2: Demonstrate key mechanisms like Decentralization, Transparency and trust, Immutability, High availability, highly secure and different types of Blockchain
CO-3: Apply the concept of Hash Function and Related Hash Algorithm to provide the security and analyze the various types of blockchains
CO-4: Understand the Crypto Currency and implement, the applications using Blockchain Technology

UNIT-I:
Introduction to Blockchain Part I: Introduction to Centralized, Decentralized and Distributed system, History of Blockchain, Various technical definitions of Blockchain.
Introduction to Blockchain Technology Part II: Generic elements of a blockchain: Block, Transaction, Peer-to-peer network, Node, Smart contract, Why It's Called "Blockchain", Characteristics of Blockchain Technology, Advantages of blockchain technology.

UNIT-II:
Concept of Blockchain Technology Part I: Cryptography, Hashing, Nonce, Distributed database, Consensus, Smart Contract, Component of block, Structure of Block chain, Technical Characteristics of the Blockchain.
Concept of Blockchain Technology Part II: Applications of blockchain technology, Tiers of blockchain technology Bolckchain 0, Bolckchain 1, Blockchain 2, Blockchain 3, Generation of Blockchain X.

UNIT-III:
Technical Foundations Part I: Cryptography, Confidentiality, Integrity, Authentication, Cryptographic primitives, Public and private keys, RSA, Discrete logarithm problem, **Hash Function:** Message Digest (MD), Secure Hash Algorithms (SHAs), Design of Secure

Hash Algorithms (SHA), SHA-256, Design of SHA3, Elliptic Curve Digital signature algorithm.
Technical Foundations Part II: Consensus algorithm: Proof of work (PoW), Proof-of-Stake (PoS), Byzantine Fault Tolerance (BFT)

UNIT-IV:
Types of Blockchain: Public blockchains, Private blockchains, Semi-private blockchains, Side chains, Permissioned ledger, Distributed ledger, Shared ledger, Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains, CAP theorem and blockchain

UNIT-V:
Financial markets and trading, Trading, Exchanges, Trade life cycle, Order anticipators, Market manipulation.
Crypto Currency: Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private keys in Bitcoin, Bitcoin currency units
Implementation Platforms: Hyperledger as a protocol, Reference architecture, Hyperledger Fabric, Transaction Flow, Hyperledger Fabric Details, Fabric Membership, Fabric Membership

TEXT BOOKS:

1. Mastering Blockchain, Imaran Bashir, 2nd Edition, Packt
2. Blockchain Basic, Daniel Drescher, A Press

REFERENCE:

1. Blockchain For Dummies®, IBM Limited Edition, John Wiley & Sons

ROBOTICS

ROBOTICS

Offered by: **ELECTRONICS AND INSTRUMENTATION ENGINEERING**

Courses in the OE Track:

OE Tracks	**V Sem (OE-I)**	**VI Sem (OE-II)**	**VII Sem (OE-III)**	**VIII Sem (OE-IV)**
Robotics	Fundamentals of Robotics	Kinematics and Dynamics of Robot	Drives and Control System for Robotics	Robot Programming and Intelligent Control Systems

ROBOTICS

Robotics is a field of study that involves the design, construction and operation of robots. This field overlaps with electronics, computer science, mechatronics and artificial intelligence. Robotic companies are booming all over the world and are seeking engineers with skills for implementing **Next -Level Automation**. This Open Elective Track for Robotics consists of four courses and is intended for making students industry ready in the field of robotics.

The First course in this track" Fundamentals **of Robotics"** introduces various physical aspects of building a robot, exploring topics like how a robot perceives its environment using Sensors and how it interacts with its environment through various Actuators & Grippers. This course also inspects a variety of robot applications in different domains.

Second Course in this track" Kinematics **& Dynamics of robots"** delves a level deeper discussing analysis and control of robots. It establishes strong mathematical foundation for describing and controlling robot movement. In this course students will learn in detail about Forward Kinematics, Inverse Kinematics, Workspace Analysis and Trajectory planning for robots.

Third Course in the Robotics track **"Drives and Control System for Robots"** explores in detail various Drive Mechanisms used in robotics such as Hydraulic, Pneumatic & Electric drives. After completing this course students will be able to analyze operational aspects of a drive system for a given robotic application. Fourth Course in the track **"Robot Programming and Intelligent Control System"** expands on Robot Programming, discussing various aspects of Robot Programming Languages and their functions. This course also dives deep into advanced topics like Artificial Intelligence, Neural Networks and Fuzzy control for robots.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EI301) FUNDAMENTALS OF ROBOTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the basic components of a Robot
- To learn different types of Robot sensors and actuators used in Robotics
- To identify different types of Robot grippers and their applications
- To acquire basic Knowledge on Robot kinematics
- To expose to various application fields of Robotics

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Gain knowledge about basic concepts of robots
CO-2: Appreciate the usage of different sensors and actuators in Robotics
CO-3: Select appropriate Gripping mechanism for a particular application
CO-4: Analyze the direct and the inverse kinematic problems
CO-5: Appreciate robot design deference's for various applications

UNIT-I:
Basic Concepts: An overview of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

UNIT-II:
Sensors: Sensor characteristics, Position sensors, Velocity sensors, Acceleration sensors, Force and Pressure sensors, Torque sensors, Microswitches, Light and infrared sensors, Touch and tactile sensors, Proximity sensors, Range finders.

UNIT-III:
Actuators: Characteristics of actuating system, Comparison of actuating systems, Hydraulic actuators, Pneumatic devices, Electric motors, Magneto-strictive actuators, Shape-Memory Metals, Electro-active Polymer Actuators.
Grippers: Classification of Grippers, Drive system for Grippers, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks and Scoops, Gripper Force analysis and design, Active and Passive Grippers.

UNIT-IV:
Kinematics: Robots as Mechanisms, Matrix Representation, Homogeneous Transformation Matrices, Representation of Transformations, Inverse of Transformation Matrices, Forward and Inverse Kinematics with Equations.

UNIT-V:

Applications: Industrial applications, material handling, processing, assembly application, inspection application, application planning, justification of robots, non-industrial applications, Robot safety.

TEXT BOOKS:

1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, 2nd Edition, Wiley
2. Robotics Technology and Flexible Automation, Deb S. R., John Wiley
3. Robotics and Control, R. K. Mittal, I. J. Nagrath, McGraw-Hill Education

REFERENCES:

1. Industrial Robotics, Technology programming and Applications, Mikell P. Groover, Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, McGraw-Hill, 2012
2. Robotics-Control, Sensing, Vision and Intelligence, K. S. Fu, R. C. Gonzalez, C. S. G. Lee, McGraw-Hill International Edition
3. Robotic Engineering–An Integrated Approach, Klafter R. D., Chimielewski T. A., Negin M., Prentice Hall of India, 2009

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1EI302) KINEMATICS OF ROBOTS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the basics of robot coordinate frames and their representation
- To obtain knowledge about direct kinematics and inverse kinematics for a robot manipulator
- To examine techniques for planning robot motion in a workspace
- To understand various methods for developing dynamic models for manipulator
- To learn control techniques applied to robot manipulators

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Mathematically represent a Robot system
CO-2: Calculate robot hand position and orientation for specific joint angles
CO-3: Calculate joint angles to achieve a particular hand position
CO-4: Plan trajectories for robot tool to do meaningful tasks
CO-5: Analyze different controlling techniques used for robot manipulators

UNIT-I:
Introduction: Introduction, position and orientation of objects, objects coordinate frame Rotation matrix, Euler angles Roll, pitch and yaw angles coordinate Transformations, Joint variables and position of end effector, Dot and cross products.

UNIT-II:
Direct Kinematics: Coordinate frames, Rotations, Homogeneous coordinates, Link coordinates D-H Representation, The ARM equation. Direct kinematic analysis for Four axis SCARA Robot and three, five and six axis Articulated Robots.

UNIT-III:
Inverse Kinematics: The inverse kinematics problem, General properties of solutions. Tool configuration, Inverse kinematics of four axis SCARA robot and three and five axis Articulated robot.

UNIT-IV:
Workspace Analysis and Trajectory Planning: Workspace Analysis, work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures, the pick and place operations, Joint space technique - continuous path motion, Interpolated motion, straight line motion and Cartesian space technique in trajectory planning.

UNIT-V:

Robot Control: The Control Problem, State Equations: one axis robot; three axis SCARA robot, Constant solutions, Linear Feedback Systems, Single Axis PID Control, PD-Gravity Control.

TEXT BOOKS:

1. Fundamentals of Robotics: Analysis & Control, Robert J. Schilling, Prentice Hall of India
2. Robotics and Control, R. K. Mittal, I. J. Nagrath, McGraw-Hill Education

REFERENCES:

1. Robotic Engineering–An Integrated Approach, Klafter. R.D, Chimielewski. T.A, Negin M, Prentice Hall of India, New Delhi, 2009
2. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover & Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, Tata McGraw-Hill Education, 2012
3. Robotics-Control, Sensing, Vision and Intelligence, K. S. Fu, R. C. Gonzalez, C. S. G Lee, McGraw-Hill International

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1EI401) DRIVE SYSTEMS FOR ROBOTS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To get acquainted with different robot drive mechanisms
- To understand in detail, working of hydraulic and pneumatic drives used in robotics
- To learn working principles of various electric drive systems for robotics
- To acquire basic knowledge on servo systems for robot control

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Categorize various drive systems for robot movement
CO-2: Select appropriate drive system for a particular application
CO-3: Inspect different hydraulic and pneumatic drives and their applications in robotics
CO-4: Inspect different electric drives and their applications in robotics

UNIT-I:
Introduction: Objectives, motivation, open loop control, closed loop control with velocity and position feedback, Types of drive systems. Functions of drive system.

UNIT-II:
Robot Drive Mechanism: Lead Screws, Ball Screws, Chain & linkage drives, Belt drives, Gear drives, Precision gear boxes, Harmonic drives, Cyclo speed reducers.

UNIT-III:
Hydraulic Drives: Introduction, Requirements, Hydraulic piston and transfer valve, hydraulic circuit incorporating control amplifier, hydraulic fluid considerations, hydraulic actuators Rotary and linear actuators. Hydraulic components in robots.

UNIT-IV:
Pneumatic Drives: Introduction, Advantages, pistons-Linear Pistons, Rotary pistons, Motors-Flapper motor, Geared motor, Components used in pneumatic control. Pneumatic proportional controller, pneumatically controlled prismatic joint.

UNIT-V:
Electric Drives: Introduction, Types, DC electric motor, AC electric motor, stepper motors, half step mode operation, micro step mode. Types of stepper motors, Direct drive actuator.

TEXT BOOKS:
1. Engineering Foundation of Robotics, Francis N-Nagy Andras Siegler, Prentice Hall

2. Robotics Engineering - An Integrated Approach, Richard D. Klafter, Thomas. A, Chri Elewski, Michael Negin, PHI Learning, 2009

REFERENCES:

1. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover & Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, Tata McGraw-Hill Education, 2012
2. Industrial Robotics, Bernard Hodges, 2nd Edition, Jaico Publishing House, 1993
3. Fundamentals of Robotics Analysis and Control, Robert J. Schilling, PHI Learning, 2009
4. Foundations of Robotics Analysis and Control, Tsuneo Yohikwa, MIT Press, 2003
5. Introduction to Robotics Mechanics and Control, John J. Craig, 3rd Edition, Pearson, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1EI402) INTELLIGENT SYSTEMS FOR ROBOTS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the fundamentals of robot programming
- To learn robot textual languages that are in common use
- To expose to artificial intelligence in robotics
- To acquire basic knowledge on neural networks in robotics
- To acquire basic knowledge on fuzzy logic in robotics

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Gain knowledge about different methods of robot programming
CO-2: Examine various robot language elements and their functions
CO-3: Analyze different AI techniques employed in robotics
CO-4: Design basic neuro-controller for robot motion control
CO-5: Apply fuzzy logic to robot control systems

UNIT-I:
Robot Programming: Methods of robot programming, leadthrough programming methods, robot program as a path in space - defining position in space, speed control, motion interpolation, WAIT, SIGNAL, DELAY commands, Branching.

UNIT-II:
Robot Languages: Textual robot language, generations of robot languages, robot language structure, operating systems, Robot language Elements and functions, constraints and variables, aggregates and location variables.

UNIT-III:
Basic Commands and Operations: Motion commands- move and related statements, speed control, points in workspace, paths and frames. End effector and sensor commands- end effector operation, sensor operation, REACT statement. Computations and operation. Program control and subroutines. Communications and data processing. Monitor mode commands.

UNIT-IV:
AI for Robotics: Introduction to Artificial Intelligence, goals of AI research, AI techniques- knowledge representation, problem representation, search techniques. LISP programming. AI and Robotics. LISP in the factory. Robotic Paradigms.

UNIT-V:
Neural Network & Fuzzy Logic Approach in Robotics: Introduction, Connectionist Models, Learning Principles and Learning Rules: Supervised, unsupervised,

reinforcement learning. Neural Network in Robotics: Control of robot hands by neural network. Introduction to fuzzy logic, Fuzzy sets, Operation of Fuzzy sets, Fuzzy rule formation, Control rules, Fuzzy algorithm in robotics, Robot obstacle avoidance using fuzzy logic.

TEXT BOOKS:

1. Industrial Robotics Technology, Programming and Applications, Mikell P. Groover, McGraw-Hill, 2012
2. Robotics Technology and Flexible Automation, Deb S. R., Tata McGraw-Hill

REFERENCES:

1. Design and Control of Intelligent Robotic Systems, (Studies in Computational Intelligence 177) M. Begum, F. Karray (auth.), Dikai Liu, Lingfeng Wang, Kay Chen Tan (eds.), Springer
2. Neural Networks in Robotics, Edited by George Bekey, Kenneth Y. Goldberg, Springer, 2012
3. Neural Networks, Fuzzy Logic, Genetic Algorithm - Synthesis and Applications, Rajasekharan and Rai, PHI Publications
4. Introduction to Neural Networks using MATLAB 6.0, S. N. Sivanandam, S. Sumathi, S. N. Deepa, Tata McGraw-Hill, 2006

CYBER SECURITY

CYBER SECURITY

Offered by: **INFORMATION TECHNOLOGY**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Cyber Security	Fundamentals of Computer Networks / Relational Database Management Systems	Cryptography & Network Security	Essentials of Cyber Security	Computer Forensics

CYBER SECURITY

Cybersecurity is **important** because it incorporates everything that relates to protecting our sensitive data, personally identifiable information (PII), protected health information (PHI), personal information, intellectual property, data, and governmental and **industry** information systems from stealing and destruction endeavoured. The cyber security track helps students to learn about how to
Defend networks and data from unapproved access.
Enhanced information security and business endurance supervision.
Upgraded stakeholder confidence in your information security preparations.
Developed company authorizations with the correct security controls in place.

Some of the more common career paths in the cyber security path are

- Chief Information Security Officer. ...
- Forensic Computer Analyst. ...
- Information Security Analyst. ...
- Penetration Tester. ...
- Security Architect. ...
- IT Security Engineer. ...
- Security Systems Administrator. ...
- IT Security Consultant.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS301) FUNDAMENTALS OF COMPUTER NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce the fundamental various types of computer networks
- To demonstrate the TCP/IP and OSI models with merits and demerits
- To explore the various layers of OSI model
- To introduce UDP and TCP models
- To have the concept of different routing techniques for data communications

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and explore the basics of Computer Networks reference models and the functionalities of physical layer
CO-2: Learn major concepts, principles involved in Data Link Layer and Network Layer
CO-3: Analyze how to maintain QoS in Network and maintaining of Congestion Control
CO-4: Demonstrate the Application Layer functionalities and importance of Security in the Network

UNIT-I:
Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.
Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

UNIT-II:
Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT-III:
Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman Ford, Disjkstra's routing protocols, RIP, OSPF, BGP and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT-IV:
Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.
Application Layer: Domain Name Space, DNS in Internet, Electronic Mail.

UNIT-V:
File Transfer Protocol, WWW, HTTP, SNMP, Multimedia.
Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

TEXT BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan, 4th Edition, McGraw-Hill Education, 2006
2. Computer Networks, Andrew S. Tanenbaum, 4th Edition, Pearson Education
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education

REFERENCES:

1. Data Communications and Networks, William Stallings
2. Data Communication and Networks, Bhusan Trivedi, Oxford University Press, 2016
3. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education
4. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS302) RELATIONAL DATABASE MANAGEMENT SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the basic concepts of database systems and design E-R models to represent simple database application scenarios
CO-2: Formulate SQL queries on the data
CO-3: Improve the database design by normalization
CO-4: Apply and relate the concept of transaction, concurrency control and recovery in database
CO-5: Familiar with basic database storage structures and access techniques using Indexing, hashing including B-tree methods

UNIT-I:
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.
Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.
Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT-II:
Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT-III:

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT-IV:

Transaction Management: Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Transaction Isolation Levels, Implementation of Isolation Levels.

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT-V:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition, McGraw-Hill Education
2. Database System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, 6th Edition, McGraw-Hill Education
3. Database Systems, R. Elmasri, Shamkant B. Navathe, 6th Edition, Pearson Education

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1IT301) CRYPTOGRAPHY AND NETWORK SECURITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Distributed Data Bases

COURSE OBJECTIVES:
- To outline security concepts, threats, attacks, services and mechanisms
- To describe various cryptosystems-symmetric key cryptography, public key cryptography
- To apply authentication services and secure hash functions
- To discuss the concepts of IP Security, web security, viruses and firewalls

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze the basics of security attacks, services, goals and mechanism
CO-2: Apply a variety of cryptographic algorithms, Hash Functions and protocols underlying network security and authentication applications
CO-3: Understand and analyze the key management requirements and implementation
CO-4: Examine and analyze various email and web security mechanisms
CO-5: Understand the system level security issues

UNIT-I:
Security Attacks: Security Attacks (Active and Passive), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and Availability) and Mechanisms, A model for Internetwork security, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II:
Conventional Encryption: Classical Encryption techniques(Rail fence, Hill Cipher, Caesar cipher, Vigenere cipher, Play Fair Cipher), Fiestel Cipher Structure, Data Encryption Standard, Block Cipher Design Principles and Modes of Operation, Triple DES, RC-4, AES Cipher, Placement of Encryption Function.
Public Key Cryptography and Authentication: Confidentiality using Symmetric Encryption – Principles of Public key Cryptosystems, RSA algorithm,

UNIT-III:
Key Management: Diffie-Hellman key Exchange, Elliptic Curve Cryptography.
Hash Functions: Hash Functions, Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard, Authentication Applications: Kerberos, X.509 Authentication Service

UNIT-IV:

Email Security and Web Security: Electronic Mail Security – PGP/ SMIME, IP security- Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Web Security- Secure Socket Layer, Transport Layer Security and Secure Electronic Transaction

UNIT-V:

System Level Security: Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practices, William Stallings, 4th Edition, Prentice Hall of India, 2005
2. Hack Proofing Your Network, Ryan Russell, Dan Kaminsky, Rain Forest, Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W. Manzuik and Ryan Permeh, Wiley Dreamtech

REFERENCES:

1. Network Security Essentials: Applications and Standards, William Stallings Prentice Hall,1999
2. Security in Computing, Charles B. Pfleeger, Shari Lawrence Pfleeger, 3rd Edition, Pearson Education, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1IT401) ESSENTIALS OF CYBERSECURITY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Cryptography and Network Security

COURSE OBJECTIVES:
- To identify the key components of cyber security in network
- To describe various security levels and categories, operating system security
- To define authentication issues and network security
- To describe memory management and protection measures

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand Information security and categorize cyber-crimes
CO-2: Demonstrate cyber offenses, security levels and models with objects and access control
CO-3: Understand Security implications and threats on Mobile devices
CO-4: Analyze tools and methods used in cybercrime
CO-5: Understand Organizational Implications and security risks

UNIT-I:
Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The lega Perspectives and Indian Perspective, Cyber crime and the Indian ITA2000, A Global Perspective on Cybercrimes.

UNIT-II:
Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cybers talking, Cyber Café and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT-III:
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, **Mobile Devices:** Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT-IV:

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse And Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT-V:

Cyber Security: Organizational Implications

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications.

Social Media Marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

1. Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and SunilBelapure, WileyIndia

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press
2. Introduction to Cyber Security, Chwan-Hwa (John)Wu, J. DavidIrwin, CRC Press T&F Group

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1IT402) COMPUTER FORENSICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Fundamentals of Computer Networks, Cryptography and Network Security, Essentials of Cyber Security

COURSE OBJECTIVES:
- To provide an understanding of computer forensics fundamentals
- To analyze various computer forensics technologies and to provide computer forensics systems
- To identify methods for data recovery
- To apply the methods for preservation of digital evidence

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Define and discuss the concepts of computer forensics
CO-2: Explain and apply the concepts of computer investigations
CO-3: Discuss the Computer Forensics Analysis and Validation and apply current practices for processing crime and incident scenes
CO-4: Select and apply current computer forensics tools
CO-5: Analyze the Windows Operating systems and DOS

UNIT-I:
Computer Forensics Fundamentals: What is Computer Forensics? Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined—DataBack-upandRecovery—TheRoleofBack-upinDataRecovery—TheData-RecoverySolution.

UNIT-II:
Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options—Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — GeneralProcedure—CollectionandArchiving—MethodsofCollection—Artifacts—
Collection Steps—Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene—Computer Evidence Processing Steps—Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication—Practical Consideration—Practical Implementation.

UNIT-II:

Computer Forensics Analysis and Validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honey net project.

Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

UNIT-IV:

Current Computer Forensic Tools: Evaluating computer forensic tool needs, computer forensic software tools, computer forensics hard ware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell Phone and Mobile Device Forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT-V:

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFSdisks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOKS:

1. Computer Forensics, Computer Crime Investigation, John R. Vacca, Firewall Media
2. Computer Forensics and Investigations, Nelson, Phillips Enfinger, Steuart, Cengage Learning
3. Real Digital Forensics, Keith J.Jones, Richard Bejtiich, Curtis W.Rose, Addison Wesley, Pearson Education

REFERENCES:

1. Forensic Compiling, A Practitioners Guide, Tony Sammes and Brian Jenkinson, Springer International
2. Computer Evidence Collection & Presentation, Christopher L. T. Brown, Firewall Media
3. Home land Security, Techniques & Technologies, Jesus Mena, Firewall Media
4. Software Forensics Collecting Evidence from the Scene of a Digital Crime, Robert M. Slade, Tata McGraw-Hill, 2005
5. Windows Forensics, Chad Steel, Wiley India Edition

DATA SCIENCES / BIG DATA AND ANALYTICS

DATA SCIENCES / BIG DATA ANALYTICS

Offered by: **INFORMATION TECHNOLOGY**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Data Sciences / Big Data & Analytics	Statistical Methods for Data Science	Computational Thinking using Python	Fundamentals of Data Mining	Data Analysis and Visualization

DATA SCIENCES / BIG DATA AND ANALYTICS

Data science helps in risk evaluation and observing, possible deceitful comportment, payments, customer analysis, and experience, among much other exploitation. The capability to make **data**-driven choices generates a steadier financial situation and **data scientists** make the strength of the **industry.**

As such, **data science** track helps students to apply business concepts in banking, finance, manufacturing, transport, e-commerce, education, etc. that use **data science**. As a consequence, there are numerous **Data Science** Applications associated to it

Job Roles in Data Science Track

- Data Analyst
- Data Engineers
- Database Administrator
- Machine Learning Engineer
- Data Scientist
- Data Architect
- Statistician
- Business Analyst
- Data and Analytics Manager

Big Data analytics track helps the students to learn the process of gathering, establishing and examining large sets of **data** (called **Big Data**) to determine patterns and other beneficial information. Analysts occupied with **Big Data** characteristically want the acquaintance that comes from investigating the **data**.

Big data analytics is the practice of mining useful information by examining different **types** of big data sets. Big data analytics is utilized to determine concealed patterns, market developments and consumer favorites, for the advantage of organizational decision making.

Job responsibilities in a Big Data Analytics Track are

- To gather and accumulate data from disparate sources, clean it, organize it, process it, and analyse it to extract valuable insights and information.
- To identify new sources of data and develop methods to improve data mining, analysis, and reporting.
- To create data definitions for new database files or alterations made to the already existing ones for analysis purposes.
- To present the findings in reports (in table, chart, or graph format) to help the management team in the decision-making process.
- To apply statistical analysis methods for consumer data research and analysis purposes.
- To keep track of the trends and correlational patterns among complex data sets.
- To perform routine analysis tasks to support day-to-day business functioning and decision making.
- To collaborate with Data Scientists to develop innovative analytical tools.
- To work in close collaboration with both the IT team and the business management team to accomplish company goals.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT303) STATISTICAL METHODS FOR DATA SCIENCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Calculus and Probability

COURSE OBJECTIVES:
- To provide insights about the basic roles of various statistical methods in building computer applications
- To develop problem-solving skills using R programming
- To understanding the importance of Data Visualization for univariate, bivariate techniques
- To inferences about the population parameters using sample data
- To understanding regression techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Analyze an extremely large data set and perform exploratory data analysis to extract meaningful insights
CO-2: Examine a real-world problem and solve the same with the Knowledge gained from various distributions study through R Programming
CO-3: Develop various visualizations of the data in hand and communicate results of analysis effectively (visually and verbally)
CO-4: Use and fit a linear regression model to data and use it for prediction
CO-5: Fit a polynomial regression model to data and use it for prediction

UNIT-I:
Introduction to Statistics and Descriptive Statistics: Definition of Statistics, Basic objectives. Applications in various branches of science with examples, Collection of Data: Internal and external data, Primary and secondary Data, Population and sample, Representative sample.
Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - Central tendency and Dispersion Bivariate data. Summarization, Marginal and Conditional frequency distribution.

UNIT-II:
Introduction to R: Introduction, Installing R and Data Types in R,
Programming using R: Operators, Conditional Statements, Looping, Scripts, Function creation. Creating list, List operations, Recursive list, creating a data frame, operations on data frames.

UNIT-III:

Data Visualization using R: Import-Export of data, Measures of central Tendency and Measures of Dispersion, Data Visualization – Scatter plot, Pie chart , Histogram, Bar chart, Box plot, Absolute and Relative frequencies, frequency distribution.

UNIT-IV:

Correlation & Linear Regression:

Correlation: Types of correlation

Linear and Multiple Regression: Introduction, the Regression Model, Multiple linear regression, Interval estimation, Estimation of parameters of β_0 and β_1, Estimation of σ^2.

UNIT-V:

Non-Linear Regression: Regression of second degree polynomial (Non-linear least square method for polynomial function), Power function, Exponential, Estimation of coefficients, Linear and Polynomial Regressions in R.

TEXT BOOKS:

1. Introductory Statistics, Thomas H. Wonnacott & Ronald J Wonnacot, John Wiley & Sons, 1969
2. Applied Statistics and Probability for Engineers, Douglas C. Montgomery, George C. Runger, 3rd Edition, John Wiley & Sons, 2003
3. R for Beginners, Sandip Rakshit, McGraw-Hill Education (Unit-II, Unit-III)

REFERENCES:

1. Statistical Methods, Rudolf J. Freund, Donna Mohr, William J. Wilson, 3rd Edition, 2010
2. R-The Statistical Programming Language, Dr. Mark Gardner, Wiley India
3. Introduction to the Theory of Statistics, A. M. Mood, F. A. Graybill and D. C. Boes, McGraw-Hill Education
4. A First Course in Probability, S. M. Ross, Prentice Hall
5. Statistical Methods, S. P. Gupta, 42nd Revised Edition, Sultan Chand & Sons, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1IT302) COMPUTATIONAL THINKING USING PYTHON

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science

COURSE OBJECTIVES:
- To Understand why Python is a useful scripting language for developers
- To create and execute Python programs and to learn how to use lists, tuples and dictionaries in Python programs
- To learn how to build and package Python modules for reusability
- To learn how to design object-oriented programs with Python classes
- To learn how to use exception handling in Python applications for error handling

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Adapt and combine standard algorithms to solve a given problem (includes numerical as well as non-numerical algorithms)
CO-2: Adequately use standard programming constructs: repetition, selection, functions, composition, modules, aggregated data (arrays, lists etc.)
CO-3: Explain what a given program (in Python) does identify and repair coding errors in a program
CO-4: Understand and use object-based software concepts (constructing OO software will be deal with in the course Software Engineering)
CO-5: Use library software for (e.g.) building a graphical user interface, web application or mathematical software

UNIT-I:
Introduction, History, Features, setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements- If, If-else, Nested If-else Looping for While Nested loops Control Statements Break Continue Pass String Manipulation Accessing Strings Basic Operations String Slices Function.

UNIT-II:
Methods, Lists: Introduction, accessing list, Operations, Working with lists, Function and Methods,
Tuple: Introduction, accessing tuples, Operations, Working Functions and Methods.
Dictionaries: Introduction, accessing values in dictionaries, Working with dictionaries, Properties.

UNIT-III:
Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.
Modules: Creation, Importing module, Math module, Random module, Packages.

Composition: Input-Output Printing on screen, reading data from keyboard, Opening and closing file Reading and writing files, Functions.

UNIT-IV:

Exception Handling: Exception, Exception Handling, except clause, Try, Finally, clause, User Defined Exceptions.

OOPs concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding, Regular Expressions-Match function, Search function, Matching vs Searching Modifiers, Patterns.

Multithreading: Thread, starting a thread. Threading module, Synchronizing threads.

UNIT-V:

CGI: Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload.

Database: Introduction, Connections, Executing queries, Transactions Handling error.

Networking: Socket, Socket Module, Methods, Client and server, Internet modules, Sending email.

TEXT BOOK:

1. Learning Python, David Ascher and Mark Lutz, O' Relly

REFERENCES:

1. Python Programming: An Introduction to Computer Science, John M. Zelle, 2nd Edition, Kindle Edition
2. Python Essential Reference, David M. Beazley, 4th Edition, Developer's Library

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1IT403) FUNDAMENTALS OF DATA MINING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science, Computational Thinking using Python

COURSE OBJECTIVES:
- To introduce the basic concepts and techniques in building a Data Warehouse
- To apply preprocessing methods for any given raw data
- To develop skills of using recent datamining software for solving practical problems
- To implement and apply basic algorithms for supervised and unsupervised learning

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Assess raw input data and process it to provide suitable input for arrange of data mining algorithms
CO-2: Discover and measure interesting patterns from different kinds of databases
CO-3: Evaluate and select appropriate data-mining classification algorithms and apply, interpret and report the output appropriately
CO-4: Design and implement data – mining applications using sample, realistic data sets and modern tools
CO-5: Evaluate and select appropriate data-mining clustering algorithms and apply, interpret and report the output appropriately

UNIT-I:
Data Warehousing & Modelling: Basic Concepts: Data Warehousing: A multitier Architecture, Data ware house models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading.

UNIT-II:
Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.

UNIT-III:
Data Warehouse Implementation & Data Mining: Data Ware house Architecture, What is data mining, Challenges, From Data Ware housing and Data Mining, Data Mining Tasks, Data Mining Functionalities, Major Issues in Data Mining. Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity.

UNIT-IV:

Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.

UNIT-V:

Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.

Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph- Based Clustering, Scalable Clustering Algorithms.

TEXT BOOKS:

1. Introduction to Data Mining, Pang-NingTan, Michael Steinbach, Vipin Kumar, First Impression, Pearson,2014
2. Data Mining-Concepts and Techniques, JiaweiHan, Micheline Kamber, Jian Pei, 3rd Edition, Morgan Kaufmann, 2012

REFERENCES:

1. Data Ware housing in the Real World, Sam Anahory, Dennis Murray, Tenth Impression, Pearson,2012
2. Mastering Data Mining, Michael J.Berry, Gordon S. Linoff, 2nd Edition, Wiley, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1IT404) DATA ANALYSIS AND VISUALIZATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science, Computational Thinking using Python, Fundamentals of Data Mining

COURSE OBJECTIVES:
- To introduce concept and characteristics of probability distribution
- To introduce underlying design principles, properties and assumptions of linear and non-linear regression modelling
- To introduce design principles involved in identifying interesting classification and prediction of data patterns
- To introduce properties of time series data and perform time series analysis

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply probability distribution concepts to identify univariate data patterns
CO-2: Apply regression modeling to build efficient mathematical models for prediction and classification
CO-3: Apply decision and regression trees for supervised learning
CO-4: Visualize time series data by applying time series techniques
CO-5: Explore case studies and projects

UNIT-I:
Data Definitions and Analysis Techniques: Elements, Variables, and Data categorization, Introduction to statistical learning, Descriptive Statistics: Measures of central tendency, Measures of location of dispersions.

UNIT-II:
Basic Analysis Techniques: Basic analysis techniques, Statistical hypothesis generation and testing, Chi-Square test, t-Test Analysis of variance, Correlation analysis, Maximum likelihood test.

UNIT-III:
Data Analysis Techniques: Regression analysis and visualization, Classification techniques and visualization, Clustering and visualization, Association rules analysis and visualization

UNIT-IV:
Time-series Analysis and Forecasting– Time-series components, Variation in Time Series, Cyclic Variation, Seasonal Variation, Irregular Variation.

UNIT-V:

Smoothing Techniques: A problem involving all four components of time series, Introduction to forecasting, forecasting models, Trend and Seasonal effects, Trend Analysis

Case-studies and Projects: Understanding business scenarios, Feature engineering and visualization, Sensitivity Analysis.

TEXT BOOKS:

1. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012
2. Data Mining: Theories, Algorithms, and Examples, Nong Ye, CRC Press Taylor & Francis Group,2014
3. Statistics for Management, David S. Rubin, Sanjay Rastogi, Masood Husain Siddiqui Richard I. Levin, 7th Edition, Pearson Learning

REFERENCES:

1. Probability & Statistics for Engineers & Scientists, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, 9th Edition, Prentice Hall
2. The Elements of Statistical Learning, Data Mining, Inference and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, 2nd Edition, Springer, 2014
3. An Introduction to Statistical Learning Mining Massive Data Sets, A. Rajaraman and J. Ullman, Cambridge University Press, 2012
4. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer

AUTONOMOUS VEHICLES

AUTONOMOUS VEHICLES

Offered by: **AUTOMOBILE ENGINEERING**

Courses in the OE Track:

OE Tracks	V Sem (OE-I)	VI Sem (OE-II)	VII Sem (OE-III)	VIII Sem (OE-IV)
Autonomous Vehicles	Principles of Automobile Engineering	Modern Automotive Technologies	Electric, Hybrid and Fuel Cell Vehicles	Connected and Autonomous Vehicles

AUTONOMOUS VEHICLES

The invention of the wheel marked a large step in the evolution of mankind. With mobility, man experienced a newfound freedom that opened the doors for several other inventions. Automobile engineering or automotive engineering is one of the most challenging careers in the field of engineering with a wide scope. This branch deals with the designing, developing, manufacturing, testing and servicing automobiles such as cars, trucks, motorcycles, scooters, etc. and the related engineering sub systems. For the perfect blend of designing and manufacturing automobiles, automobile engineering uses the features of different elements of engineering such as mechanical, electrical, electronic, instrumentation, civil, software and safety engineering. Exploring the topic from an interdisciplinary perspective is indispensable. Globalization and incredible growth of automobile industry have resulted in numerous opportunities for engineers both in India and abroad.

The 17^{th} and 18^{th} centuries were mostly about steam-powered vehicles transporting people and goods. While electric cars enjoyed popularity in the A19^{th} and early 20^{th} centuries, the later period saw the accelerated adoption of the petrol car, due to its advantages of power, mass production, cost and advances in the internal combustion engine. It is only in the 21^{st} century that interest in electric cars has come back, given the need for cleaner, greener modes of transport. The modern period is associated with several path breaking technologies. Over the last couple of decades, there has been an explosion of electronics in vehicles. Connected cars that include technology features are ever more popular. These smart cars come with internet access, GPS, wi-fi, superior infotainment, advanced telematics and navigation capabilities. More innovations in in-vehicle infotainment and electronics promise to give car users even more enhanced capabilities in the near future.

Today, safety has become a larger concern than ever before. While entertainment and infotainment have made car driving a pleasure, this has also given rise to a growing tribe of distracted drivers. Add to this, underdeveloped roads, which take a toll on drivers today. Increased distractions and fatigue can also contribute to human fatalities. The future certainly points in the direction of driverless cars, which promise to alleviate concerns of traffic congestion and road safety. Driverless cars, also known as autonomous cars, will usher in a paradigm shift in the evolution of the modern automobile. Self-driving cars can sense the environment and traffic with the help of RADAR, LIDAR, GPS and computer vision and navigate without human intervention. Autonomous cars are claimed to have greater accuracy, reliability and faster reaction time compared to human drivers. This would lead to fewer traffic collisions and less road congestion.

Autonomous driving is a popular subject of today's discussion and automakers are developing complex systems that allow cars to drive themselves. If technology continues on its current course, car will do the concentrating for you. Self-parking, automatic emergency braking, adaptive cruise control and lane keeping are just some of the technologies that have leapt into the market in the past few years. Put them all together, get a picture of driving to assisted driving to fully autonomous cars. The open elective track "Autonomous Vehicles" offered by the department of automobile engineering trains the students to meet the technological challenges and diverse needs of the industry and society in various areas of automobile engineering and equips them to excel in a truly competitive industry. With through knowledge in this filed, engineering graduates get opportunity to serve many top-notch automobile companies and IT companies as well.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1AE301) PRINCIPLES OF AUTOMOBILE ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the layout of an automobile and functionalities subsystems
- To provide overview on concepts of engine, cooling, lubrication and fuel systems
- To present constructional features and working of automotive driveline and running systems
- To study the fundamentals and principles of automotive electrical systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the functionalities of automotive systems and subsystems
CO-2: Give an overview on engine and engine subsystems
CO-3: Describe working of automotive driveline and running systems
CO-4: Discuss the concepts of automotive starting, ignition and charging systems

UNIT-I:
Introduction: History, classification of automobiles, layout of an automobile, automobile sub systems and their role, types of chassis layouts and types of bodies.
Engine: Classification and components of an engine, principle and working of four stoke and two stroke SI and CI engines, air intake and exhaust system, fuel system layout for petrol and Diesel engines.

UNIT-II:
Cooling and Lubrication: Necessity of cooling, air-cooling, water cooling - thermosyphon and pump cooling, radiator, pump, thermostat, antifreeze solution and radiator fan. Mist, splash and forced lubrication, oil filters and oil pumps.

UNIT-III:
Drive Line: Clutches, principle, single plate clutch, multi plate clutch and centrifugal clutch. Gear box - Need, sliding mesh, constant mesh and synchromesh gear box. Propeller shaft, universal joint, differential, wheels and tyres.

UNIT-IV:
Running Systems: Suspension systems – Objective, rigid axle and independent suspension system and torsion bar. Steering system – Layout, steering mechanism, steering geometry and steering gearboxes. Brake system – Principle, stopping distance, types of brakes and actuation.

UNIT-V:
Electrical Systems: Starting system - Principle, working of different starter drive units and solenoid switches. Ignition system - Conventional ignition system types, ignition

advance and retarding mechanisms. Charging system - Alternator principle, construction and working, cut-outs and regulators.

TEXT BOOKS:

1. Advanced Vehicle Technology, Heinz Heisler, Butterworth Heinemann, 2002
2. Automobile Electrical Equipment, Crouse W. H., 3rd Edition, McGraw-Hill, 1986

REFERENCES:

1. Motor Vehicle, Garrett T. K., Newton K. and Steeds W., Butterworths & Co., 2001
2. Automotive Electrical Equipment, Kohli P. L., Tata McGraw-Hill, 1975
3. Automotive Chassis and Body, Crouse W. H., 5th Edition, McGraw-Hill, 1976
4. Automotive Mechanics, Giri N. K., Khanna Publications, 2006

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106088/
2. https://www.youtube.com/watch?v=BOP8qLQzhDc

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VI Semester

(22OE1AE302) MODERN AUTOMOTIVE TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Automobile Engineering

COURSE OBJECTIVES:
- To provide an overview on advanced engine control system concepts
- To understand the interdisciplinary concepts and GPS-enabled applications in automobile
- To present intelligent vehicle technologies like comfort, safety and security systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply advanced engine control system concepts in engineering
CO-2: Address the key technologies in automotive navigation
CO-3: Appreciate the technological advancements driver assistance systems

UNIT-I:
Advanced Engine Controls: Concept of an electronic engine control system, engine control module, powertrain control module, electronic fuel injection - throttle body fuel injection, multi-point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control, engine mapping and on-board diagnostics.

UNIT-II:
Telematics: Global positioning system, geographical information systems, navigation system, architecture, automotive vision system, road recognition and infotainment system.

UNIT-III:
Comfort Systems: Adaptive cruise control system, active suspension system, power steering, collapsible and tiltable steering column and power windows.

UNIT-IV:
Safety Systems: Active and passive safety, airbags, seat belt tightening system, forward collision warning systems, child lock, anti-lock braking systems, traction control system and lane departure warning system.

UNIT-V:
Security Systems: Anti-theft technologies – mechanical, electromechanical and electronic immobilizers, alarm system, stolen vehicle tracking system, remote keyless entry, smart card system and number plate coding.

TEXT BOOKS:

1. Understanding Automotive Electronics, William B. Ribbens, 5th Edition, Butter worth Heinemann,1998
2. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann, 2001

REFERENCES:

1. Automotive Handbook, Robert Bosch, 5th Edition, SAE, 2000
2. Navigation and Intelligent Transportation Systems – Progress in Technology, Ronald K. Jurgen, Automotive Electronics Series, SAE, 1998
3. Understanding Automotive Electronics, Bechhold, SAE, 1998

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106088/
2. https://www.youtube.com/watch?v=BOP8qLQzhDc

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VII Semester

(22OE1AE401) ELECTRIC, HYBRID AND FUEL CELL VEHICLES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Automobile Engineering, Modern Automotive Technologies

COURSE OBJECTIVES:
- To study the concepts and drivetrain configurations of electric and hybrid vehicles
- To understand about electric propulsion system
- To provide various energy storage devices
- To present principle, working and automotive applications of fuel cell and solar technology

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the concepts and drivetrain configurations of electric and hybrid vehicles
CO-2: Present various electric motors used in EVs and HEVs
CO-3: Control electric motors used in EVs and HEVs
CO-4: Discuss various energy storage devices and hybridization
CO-5: Describe automotive applications of fuel cell and solar technology

UNIT-I:
Electric and Hybrid Vehicles: Electric vehicle – layout, components, configurations, advantages and limitations. Hybrid vehicle - concepts of hybrid electric drivetrain based on hybridization and powertrain configuration, architecture of series, parallel and series-parallel hybrid electric drivetrains, modes of operation, merits and demerits.

UNIT-II:
Electric Motors: Review of technology suited to automotive propulsion, requirements, DC motors, Induction motors, permanent magnet brushless DC motors, permanent magnet synchronous motors and switched reluctance motors.

UNIT-III:
Motor Drives: Speed and torque control, DC motor - Chopper based four quadrant operations, induction motor, permanent magnet motor and switched reluctance motor.

UNIT-IV:
Energy Storages: Electromechanical batteries - Types, parameters, lead acid batteries, nickel-based batteries, lithium-based batteries, battery management system, ultracapacitors, hybridization of energy storages and battery swapping technology.

UNIT-V:

Fuel Cell and Solar Vehicles: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, CRC Press, 2004
2. Electric Vehicle Technology-Explained, James Larminie and John Loury, John Wiley & Sons, 2003

REFERENCES:

1. Electric and Hybrid Vehicles – Design Fundamentals, Iqbal Husain, CRC Press, 2010
2. Electric Vehicle Battery Systems, Sandeep Dhameja, Butterworth–Heinemann, 2002
3. Electric and Hybrid – Electric Vehicles, Ronald K. Jurgen, SAE, 2002
4. Light Weight Electric/Hybrid Vehicle Design, Ron Hodkinson and John Fenton, Butterworth–Heinemann

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee112/preview
2. https://elearn.nptel.ac.in/shop/nptel/electric-vehicles-and-renewable-energy

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. VIII Semester

(22OE1AE402) CONNECTED AND AUTONOMOUS VEHICLES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Principles of Automobile Engineering, Modern Automotive Technologies, Electric, Hybrid and Fuel Cell Vehicles

COURSE OBJECTIVES:
- To understand the fundamentals of vehicle communication and networking
- To present the applications of communications technologies in AVs
- To know intra-vehicle and inter-vehicle communication technologies
- To provide various levels of vehicle autonomy and current State of AVs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the fundamentals of vehicle communication and networking
CO-2: Relate the applications of communications technologies in AVs
CO-3: Appreciate the intra-vehicle communication technologies
CO-4: Express the inter-vehicle communication technologies
CO-5: Discuss various levels of vehicle autonomy and current state of AVs

UNIT-I:
Communication Fundamentals and Controller Area Network: Communication fundamentals – frequency, bandwidth, power measurement, signal to noise ratio, transmission rate constraints, radio frequency spectrum allocation, RADAR operation and types of RADAR. CAN evolution, versions, types of controllers and layered architecture. CAN bus, message frames and error handling.

UNIT-II:
Introduction to Vehicle Communications: Intra-vehicle communications - communications protocols, systems and sensors (Braking, steering, power train, chassis systems, body electronics, instrument clusters, infotainment systems), inter-vehicle communications - cooperative driving (accident warning, frontal/rear collision prevention, lane change, assistance). Consumer assistance – traffic information, multimedia support and smart parking.

UNIT-III:
Intra-Vehicle Communications: Wired communication – Network comparison, two tier approach, LIN applications - Localized vehicle area support, general support areas, CAN applications - In vehicle operation, infotainment, wireless communication – Bluetooth vehicle applications, satellite services – satellite radio, vehicle care and traffic status.

UNIT-IV:

Inter-Vehicle Communication: Adhoc communications – applications in vehicle traffic monitoring, collision and congestion avoidance, highway lane reservation, emission control, vehicle frequency utilization – AM radio, Bluetooth, FM radio, GPS, short range RADAR, wireless LAN, intelligent roadway-infrastructure to vehicle and vehicle to vehicle communications. Evolving smart vehicle – ECU, wireless networking, forward RADAR, side RADAR, GPS, cellular transmission and event Recorder.

UNIT-V:

Autonomous Vehicles: Importance, levels of automation, policy making, social costs, safety and crashes, congestion, land use, energy and emissions, costs and disadvantages.

Current State of Autonomous Vehicles: Research, challenges, commercial development, sensor systems, sensor suits, environmental challenges, graceful degradation, V2V and V2I communication, sharing the drive, integrity, security, verification and policy implications.

TEXT BOOKS:

1. Inter and Intra Vehicle Communications, Gilbert Held, Auerbach Publications, 2008
2. Autonomous Vehicle Technology-A Guide for Policymakers, James M. Anderson, Nidhi Kalra, Karlyn D. Stanley, Paul Sorensen, Constantine Samaras, Oluwatobi A. Oluwatola, RAND Corporation, Santa Monica, 2016
3. Autonomous Driving - Technical, Legal and Social Aspects, Markus Maurer, J. Christian Gerdes, Barbara Lenz, Hermann Winner (Eds.), Springer, 2016

REFERENCES:

1. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann, 2001
2. Navigation and Intelligent Transportation Systems – Progress in Technology, Ronald K. Jurgen, Automotive Electronics Series, SAE, 1998
3. Automotive In–vehicle Networks, J. Gabrielleen, Wiley-Blackwell, 2008
4. In-Vehicle Network Architecture for the Next-Generation Vehicles, Syed Masud Mahmud, IGI
5. Communication Technologies for Vehicles, Mohamed Kassab Springer, 2015

ONLINE RESOURCES:

1. https://www.classcentral.com/subject/autonomous
2. https://www.youtube.com/watch?v=MX6aEkcFu6U

GENERAL - COMPUTING

GENERAL-COMPUTING

Offered by: COMPUTER SCIENCE AND ENGINEERING / INFORMATION TECHNOLOGY

Courses in the Pool:

- Programming through Java
- Relational Data Base Management Systems
- Computational Thinking using Python
- Introduction to Data Analytics
- Fundamentals of Computer Algorithms

1. PROGRAMMING THROUGH JAVA

Java is an extensively **used** programming language specifically intended for use in the distributed environment of the internet. **Java** help students to create wide-ranging applications that possibly will run on a single workstation or be distributed among servers and clients in a network.

Java is an extremely fruitful language and an upper option for many developers for many years. The motive that it has remained so prevalent is since it still happens the needs of functioning across networks.

Students will have different roles and responsibilities by learning Java Programming

- Designing, implementing, and maintaining Java applications that are often high-volume and low-latency, required for mission-critical systems.
- Delivering high availability and performance.
- Contributing in all phases of the development lifecycle.
- Writing well-designed, efficient, and testable code.

2. RELATIONAL DATABASE MANAGEMENT SYSTEMS

A relational database permits you to effortlessly find precise information. It also consents you to sort based on any field and produce reports that comprise only definite fields from each record. With features like, Data Accuracy, Easy Access to Data, Data Integrity, Flexibility, Normalization, High Security, Feasible for Future Modifications

By learning RDBMS Students will have different roles in Database environment

- Data Administrator,
- Database Administrator
- Database Designer
- Application Programmer

3. COMPUTATIONAL THINKING USING PYTHON

The **python** language is one of the utmost accessible programming languages available because it has streamlined syntax and not complex, which gives more importance on natural language. Due to its comfort of learning and practice, **python** codes can be readily written and executed much quicker than former programming languages.

Data Science: The libraries and frameworks Python offers, e.g. PyBrain, PyMySQL, and NumPy are one of the big reasons. Another reason is diversity. Python experience allows you to do a lot more than any other language, e.g. you can create scripts to automate stuff, go into web development, and so much more.

Students will have various Job Profiles by learning Python

- Software Engineer.
- Python Developer.
- Research Analyst.
- Data Analyst.
- Data Scientist.
- Software Developer.

4. INTRODUCTION TO DATA ANALYTICS

Data Scientists and Analysts **use data analytics** techniques in their research, and businesses also **use** it to inform their conclusions. **Data analysis** can assistance corporations healthier comprehend their customers, assess their ad-campaigns, personalize gratified, create content approaches and progress products.

By learning Data Analytics students will get Jobs with different designations

- IT Systems Analyst. Systems analysts use and design systems to solve problems in information technology. ...
- Healthcare Data Analyst. ...
- Operations Analyst. ...
- Data Scientist. ...
- Data Engineer. ...
- Quantitative Analyst. ...
- Data Analytics Consultant. ...
- Digital Marketing Manager.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT303) PROGRAMMING THROUGH JAVA

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce object-oriented programming concepts using the Java language
- To introduce the principles of inheritance and polymorphism and demonstrates how they relate to the design of abstract classes
- To introduce the implementation of packages and interfaces
- To introduce exception handling, event handling and multithreading

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Develop applications for range of problems using object-oriented programming techniques

CO-2: Design simple graphical user interface applications

CO-3: Explore the design of graphical user interface using applets and swings

UNIT-I:

Object Oriented Thinking and Java Basics: Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.

UNIT-II:

Inheritance, Packages and Interfaces: Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class.

Defining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

UNIT-III:

Exception Handling and Multi-threading: Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage

of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.
String Handling, Exploring Java. Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads. Enumerations, Autoboxing, Annotations, Generics.

UNIT-IV:
Event Handling: Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.
The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

UNIT-V:
Applets: Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.
Swing: Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- Japplet, Jframe and Jcomponent, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:
1. Java The Complete Reference, Herbert Schildt, 7th Edition, Tata McGraw-Hill
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education
3. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons

REFERENCES:
1. Introduction to Java Programming, Y. Daniel Liang, Pearson Education
2. An Introduction to Java Programming and Object-Oriented Application Development, R. A. Johnson, Thomson
3. Core Java 2, Vol. 1 - Fundamentals, Cay. S. Horstmann and Gary Cornell, 8th Edition, Pearson Education
4. Core Java 2, Vol. 2 - Advanced Features, Cay. S. Horstmann and Gary Cornell, 8th Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS302) RELATIONAL DATABASE MANAGEMENT SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the basic concepts and the applications of database systems
- To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demonstrate the basic concepts of database systems and design E-R models to represent simple database application scenarios
CO-2: Formulate SQL queries on the data
CO-3: Improve the database design by normalization
CO-4: Apply and relate the concept of transaction, concurrency control and recovery in database
CO-5: Familiarize with basic database storage structures and access techniques using Indexing, hashing including B tree methods

UNIT-I:
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages – DDL, DML, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.
Introduction to Database Design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.
Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

UNIT-II:
Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT-III:

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization, Schema Refinement in Database Design, Other Kinds of Dependencies.

UNIT-IV:

Transaction Management: Transactions, Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Transaction Isolation Levels, Implementation of Isolation Levels.

Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.

Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

UNIT-V:

Storage and Indexing: Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Intuition for tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash- Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition, McGraw-Hill Education
2. Database System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, 6th Edition, McGraw-Hill Education
3. Database Systems, R. Elmasri, Shamkant B. Navathe, 6th Edition, Pearson Education

REFERENCES:

1. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning
2. Introduction to Database Management, M. L. Gillenson and others, Wiley Student Edition
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Introduction to Database Systems, C. J. Date, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT302) COMPUTATIONAL THINKING USING PYTHON

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Statistical Methods for Data Science

COURSE OBJECTIVES:
- To Understand why Python is a useful scripting language for developers
- To create and execute Python programs and to learn how to use lists, tuples and dictionaries in Python programs
- To learn how to build and package Python modules for reusability
- To learn how to design object-oriented programs with Python classes
- To learn how to use exception handling in Python applications for error handling

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Adapt and combine standard algorithms to solve a given problem (includes numerical as well as non-numerical algorithms)
CO-2: Adequately use standard programming constructs: repetition, selection, functions, composition, modules, aggregated data (arrays, lists etc.)
CO-3: Explain what a given program (in Python) does identify and repair coding errors in a program
CO-4: Understand and use object-based software concepts (constructing OO software will be deal with in the course Software Engineering)
CO-5: Use library software for (e.g.) building a graphical user interface, web application or mathematical software

UNIT-I:
Introduction, History, Features, setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, Conditional Statements- If, If-else, Nested If-else Looping for While Nested loops Control Statements Break Continue Pass String Manipulation Accessing Strings Basic Operations String Slices Function.

UNIT-II:
Methods, Lists: Introduction, accessing list, Operations, Working with lists, Function and Methods,
Tuple: Introduction, accessing tuples, Operations, Working Functions and Methods.
Dictionaries: Introduction, accessing values in dictionaries, Working with dictionaries, Properties.

UNIT-III:
Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.
Modules: Creation, Importing module, Math module, Random module, Packages.

Composition: Input-Output Printing on screen, reading data from keyboard, Opening and closing file Reading and writing files, Functions.

UNIT-IV:

Exception Handling: Exception, Exception Handling, except clause, Try, Finally, clause, User Defined Exceptions.

OOPs concept: Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding, Regular Expressions-Match function, Search function, Matching vs Searching Modifiers, Patterns.

Multithreading: Thread, starting a thread. Threading module, Synchronizing threads.

UNIT-V:

CGI: Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload.

Database: Introduction, Connections, Executing queries, Transactions Handling error.

Networking: Socket, Socket Module, Methods, Client and server, Internet modules, Sending email.

TEXT BOOK:

1. Learning Python, David Ascher and Mark Lutz, O' Relly

REFERENCES:

1. Python Programming: An Introduction to Computer Science, John M. Zelle, 2nd Edition, Kindle Edition
2. Python Essential Reference, David M. Beazley, 4th Edition, Developer's Library

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT304) INTRODUCTION TO DATA ANALYTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To be exposed to conceptual framework of big data
- To understand different techniques of data analysis
- To be familiar with concepts of data streams
- To be exposed to item sets, clustering, frame works and Visualization

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand big data fundamentals
CO-2: Learn various data analysis techniques
CO-3: Implement various data streams
CO-4: Understand item sets, clustering, frame works &Visualizations

UNIT-I:
Introduction to Big Data: Introduction to Big Data Platform – Challenges of Conventional systems – Web data – Evolution of Analytic scalability, analytic process and tools, Analysis vs Reporting–Modern data analytic tools,
Statistical Concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT-II:
Data Analysis: Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and Kernel methods
Analysis of Time Series: Linear systems analysis, nonlinear dynamics – Rule induction –
Neural Networks: Learning and Generalization, competitive learning, Principal component analysis and neural networks
Fuzzy Logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT-III:
Mining Data Streams: Introduction to Streams Concepts–Stream data model and architecture–Stream Computing, Sampling data in a stream–Filtering streams–Counting distinct elements in a stream–Estimating moments–Counting onenessina Window–Decaying window–Real time Analytics Platform (RTAP)applications–case studies–real time sentiment analysis, stock market predictions.
Frequent Item sets and Clustering: Mining Frequent item sets– Market based Modeling A priori Algorithm– Handling large datasets in Main Memory–Limited Pass Algorithm–Counting frequent item sets in a Stream–Clustering Techniques –Hierarchical–K-Means.

UNIT-IV:

Clustering high dimensional data– CLIQUE and Pro CLUS–Frequent pattern-based clustering methods – Clustering in non-Euclidean space – Clustering for streams and Parallelism.

UNIT-V:

Frameworks and Visualization: MapReduce–Hadoop, Hive, Map R–Sharding–No SQL Databases – S3 – Hadoop Distributed file systems – Visualizations – Visual data analysis techniques,

Interaction Techniques: Systems and Applications

TEXT BOOKS:

1. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007
2. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, Cambridge University Press, 2012

REFERENCES:

1. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, John Wiley & Sons, 2012
2. Big Data Glossary, Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, Pete Warden, O'Reilly, 2011
3. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, 2nd Edition, Elsevier, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS305) FUNDAMENTALS OF COMPUTER ALGORITHMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To reinforce algorithms analysis methods
- To ability to analyze running time of an algorithm
- To understand different algorithm design strategies
- To familiarity with an assortment of important algorithms

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the concepts of computing complexity measures of algorithms
CO-2: Apply Divide and conquer method to solve engineering problems
CO-3: Illustrate the usage of the greedy method for optimization problems
CO-4: solve the complex recursive problems with dynamic programming strategy
CO-5: Examine the complexity classes, backtracking and branch & bound strategies

UNIT-I:
Introduction: Characteristics of algorithms. Analysis of algorithms: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs.

UNIT-II:
Divide and Conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication. Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT-III:
Greedy Method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem, Huffman Codes.

UNIT-IV:
Dynamic Programming: General method, Principle of optimality, applications-Multistage graphs, Matrix chain multiplication, Optimal binary search trees.
0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT-V:
Backtracking: General method, applications- N-Queen problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles.

Branch and Bound: Traveling Salesperson problem, 0/1 Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution.
NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, E. Horowitz et al, Galgotia Publications
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Lieserson, Ronald L. Rivest and Clifford Stein, 4th Edition, MIT Press/McGraw-Hill

REFERENCES:

1. Algorithm Design, Jon Kleinberg and Eva Tardos, 1st Edition, Pearson
2. Algorithm Design: Foundations, Analysis and Internet Examples, Michael T. Goodrich and Roberto Tamassia, 2nd Edition, Wiley
3. Algorithms – A Creative Approach, Udi Manber, 3rd Edition, Addison-Wesley, Reading, MA
4. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition, Pearson Publications

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS306) INTRODUCTION TO FRONT END TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To enable participants to develop elegant and responsive Front-end by leveraging latest technologies
- To enable them to learn new technologies by applying foundation paradigms
- To understand how HTML, CSS, Javascript and Bootstrap work together
- To use jQuery to create webpages

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply HTML, CSS and JavaScript to develop dynamic web pages
CO-2: Use advanced technologies jquery and json to make web responsive and interactive web pages
CO-3: Demonstrate Bootstrap to make customized applications
CO-4: Apply the concepts of AngularJS in developing Web applications

UNIT-I:
Overview of HTML, CSS : Fundamentals of HTML,HTML Headings ,HTML Paragraph, HTML Styles, HTML Formatting , HTML Quotations, HTML Computer Code, HTML Comments & Colors, HTML CSS, Links and Images, HTML Lists, HTML Blocks , HTML Classes ,HTML Layout ,HTML Responsive , HTML iframes, Creating Style Sheet, CSS Box, Model- Border properties, Padding properties, Margin properties, CSS Navigation Bar , CSS Dropdowns ,CSS Tooltips , CSS3 Animations , CSS3 Buttons , CSS3 Pagination, CSS3 Multiple Columns .

UNIT-II:
Introduction to JavaScript: Introduction to JavaScript, Statements, expressions, Working with Web Forms and validating user input, JavaScript functions and events, Error handling in JavaScript, Document Object Model, Programming HTML DOM with JavaScript, Assigning event handlers in JavaScript using DOM object property.

UNIT-III:
Working with jQuery and JSON: Basics of jQuery, jQuery Events, Benefits of using CDN, jQuery Selectors, jQuery input vs :input, jQuery DOM manipulation methods, jQuery Elements, Working with JSON Objects, JSON Arrays, Nested JSON object, Conversion of JSON object to string, Conversion of string to JSON object.

UNIT-IV:
Working with Bootstrap: Introduction to Bootstrap, Setting up Bootstrap, Bootstrap Grid System, Bootstrap Image Gallery, Bootstrap Typography, Bootstrap Blockquotes and

Lists, Bootstrap Code Blocks, Bootstrap Table Classes, Bootstrap Button Classes, Bootstrap Dropdown.

UNIT-V:

Introduction AngularJs: Building Single page applications with AngularJS Single page application – introduction, two way data binding, MVC in angular JS, controllers, getting user inputs, loops, Client side routing – accessing URL data, various ways to provide data in angular JS.

TEXT BOOKS:

1. HTML 5 Black Book, Dt Editorial Services, Dreamtech Press
2. Learning Web Development with Bootstrap and AngularJS, Radford S., Packt Publishing, 2015
3. Beginning JavaScript and CSS Development with JQuery, York R., Wiley, 2011

REFERENCES:

1. Learning Web Development With Bootstrap And AngularJS, Stephen Radford, Packt Publishing
2. HTML & CSS: The Complete Reference, Powell T. A., 5th Edition, McGraw-Hill, 2010

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS307) GENERATIVE AI

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand what Generative AI is and why it matters
- To know how it's shaping the future of business
- To analyze different AI tools
- To decide about the application of Generative AI in various domains

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Demystify the technical terminology surrounding Generative AI
CO-2: Understand the significance of Generative AI in today's digital landscape
CO-3: Gain hands-on experience with state-of-the-art AI tools
CO-4: Make informed decisions about the application of Generative AI in various domains

UNIT-I:
Introduction and Capabilities of Generative AI: Introduction to Generative AI, Capabilities of Generative AI, Text Generation using Generative AI.

UNIT-II:
Applications and Tools of Generative AI: Applications of Generative AI, Economic Potential of Generative AI, Tools for Image Generation, Tools for Audio and Video Generation, Tools for Code Generation

UNIT-III:
Generative AI for your own Industry: Impacts of generative AI on your own Industry, Use cases of Generative AI, AI and Digital Transformation, Impact of Generative AI over job roles, Developing Internal Policies.

UNIT-IV:
Strategic Planning in the age of AI: Roles of AI in Strategic Decision-making, Building AI Policies within Your Organization, Build a Plan for Implementing Generative AI in Your Organization

UNIT-V:
Prompt Engineering and Advanced ChatGPT: Introduction to Advanced ChatGPT, Advanced Techniques for Prompting ChatGPT, Applications of Advanced ChatGPT, Chatbot Development with ChatGPT, Advanced Integration with Other Tools.

TEXT BOOKS:
1. Generative Deep Learning, David Foster

2. Hands-On Generative AI with Python, Kirill Dubovikov
3. Research papers from top conferences (NeurIPS, ICML, etc.)

GENERAL

Professional Ethics and Human Values

Ethics is a necessary and listed Graduate Attribute for all engineers according to the Washington Accord. As engineers deal with society and provide for society, it is important that the ethical concerns pertaining to technology are well understood and addressed, particularly when technological advancements are still in their infancy and early growth stages but already enjoy a widespread use! Human Values form the basis for all ethics, and ethical theories help resolve professional dilemmas too. This course aims to create an appreciation for normative and applied ethics with special focus on professionalism as well as technology education and practice. Given the diverse set of roles a STEM professional may play in a society, there is an inherent societal need for STEM professionals to be ethical. The formative years of students of engineering are deemed the best time to impress upon them the practical importance and application aspects of ethics. The curriculum is designed to include an inherent appreciation for the Indian Ethos and cover a wide variety of topics with suitable case studies and examples all through. The course is aimed to become a practicable guide that enables the learners to apply the learned content while facing the practical contexts encountered in their individual life and career, even as the times and lives are ever-changing.

As a course designed to ideally educate and empower all engineers, this course content contributes substantially to the attainment of "Ethics" as one of the eleven Graduate Attributes identified in the Washington Accord, and contributes moderately to a few other Graduate Attributes—including but not limited to The Engineer and The World, Lifelong Learning, and Design/Development of Solutions—while also contributing slightly to the attainment of some more Graduate Attributes such as Individual and Collaborative Team Work, Communication, Project Management and Finance.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1HS301) PROFESSIONAL ETHICS AND HUMAN VALUES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To emphasize on the importance of ethics for STEM professionals
- To help create a personal and practicable toolkit for ethical behaviour in personal and professional settings
- To relate the profession of engineering to sociocultural, ethical, and moral contexts in India and globally
- To develop more socially conscious STEM professionals who create and conceive a better society and a better world without sacrificing or ignoring public good

COURSE OUTCOMES: After completion of the course the students should be able to
CO-1: Distinguish morals, values, and ethics in Indian and global contexts as well as personal, sociocultural, and professional contexts
CO-2: Resolve moral and ethical dilemmas through relevant ethical guidance using ethical inquiries and/or appropriate ethical theories
CO-3: Demonstrate understanding of professionalism and be responsible social experimenters as STEM professionals in diverse roles
CO-4: Be conscientious about professional contributions that adhere to digital and technology ethics principles in ensuring public welfare and sustainable development
CO-5: Extend and apply individual moral/ ethical persona in organizational, business, and global environments

UNIT-I:
Introduction and Motivation
Definitions: Morals, Values, Ethics; Golden Rule; Maslow's Theory of Needs; Diversity, Equity, Inclusivity, and Accessibility (DEIA); Sustainable Development Goals (SDG)
Human Values: Universal Human Values, Conventional and Constitutional Values in Indian Ethos, Building Blocks for Moral Persona—Conscientiousness, Integrity, Empathy Morality and Moral Development: Moral Character, Moral Autonomy; Platform vs. Purpose
Ethicality: Civic Virtue for Ideal Society vs. Anomie; Ethics as basis for Legal Framework; Indian Ethos
Motivation: Examples and Case Studies of Ethical and Moral Decline in social, business, and professional contexts; Threats to Ethics due to changing technology landscape; Need for protection of Personally Identifiable Information (PII) and Data Privacy; Introduction to Trolley Problem and Discussion on Moral and Ethical Dilemmas; Issues in Decision-making—Value Judgement and Moral Judgement; Ethics in Academics and Research

UNIT-II:

Human Values, Moral Development, and Ethical Theories of Right Action

Moral Development: Kohlberg's Theory vs. Gilligan's Theory; Understanding Biases

Ethical Theories: Classification of Ethical Theories—Prescriptive, Descriptive, and Applied Ethics by Character and by Conduct; Deontological Ethics (Immanuel Kant, John Rawls), Virtue Ethics (Aristotelianism), Consequentialism (Act & Rule Utilitarianism); Divine Command Ethics and Ethics through Spirituality; Ethical Pluralism; Overview of Rights Theories

Ethical Guidance: Ethical Frameworks and Values for organisations; Practicable guidance from the Bhagavad-Gita and Eastern Philosophies; Ethical Inquiries—Normative, Conceptual, and Factual; Ethical Decision-making Tools; Ethics and Law—Ethics as a Basis for Law, Awareness of Rights of Convicts and Criminals

UNIT-III:

Ethics for STEM Professionals

Profession and Professionalism: Definitions; Professional Characters, Traits, Virtues, Roles, Rights and Responsibilities; Overview of Business Ethics and Work Ethics; STEM Professionals as Managers, Leaders, Consultants, Expert Witnesses, Scientists, Researchers and Academicians, and Entrepreneurs

STEM Profession as Social Experimentation: Comparison with scientific experiments; Application of Ethical Theories and Ethical Inquiries in professional contexts to gather relevant information; Informed Consent

Responsibilities of STEM Professionals as Social Experimenters: Need for being Ethical by Design; Accountability and Answerability in general and in autonomous technology applications; Focus on DEIA, SDG, and Social Innovation; Guidance through Professional Societies

UNIT-IV:

Understanding Ethics through STEM Case Studies

Safety and Risk: Understanding Safety and Risk through case studies—Titanic, Chernobyl, Bhopal; Overview of risks implied by digital technologies

General Aspects: Environmental Ethics and Carbon Footprint; Non-disclosure Agreements (NDA) and Intellectual Property (IP) as a Professional Right and as exploited by businesses; Copyrights and Ethics in Arts; Social Engineering and Ethics

Digital Ethics: Data Ethics; Ethics of AI; Ethics on Social Media; Ethics of Humans as Data Objects; Legal frameworks and policies for Data Management—Content Development, Protection, Integrity, Transparency, and Accountability; Ethics in the context of emerging technology areas such as Large Language Models (LLM), Digital Forensics, Internet of Things (IoT), Robotics and Automation, Cybersecurity & Cybercrime, Healthcare & Clinical Management, Finance, and Personal Tech

Technology Ethics: Computer Ethics, Machine and Robot Ethics; Ethics of technology advancements — an ethical urge to create green technologies, steps taken in the EU

UNIT-V:

Ethics for Workplace and Societal Wellbeing

Ethics in Organizational Behavioral Aspects: Collegiality, Loyalty, Trust; Workplace Deviances, Occupational Crime, and Culpability; Employee Rights and Relations; Ethical Frameworks and Codes of Ethics and Conduct; Conflicts of Interest, Conflict

Management and Resolution; Creating Ethical Climate, Ethics Education and Training, Grievance Redressal Procedures; Whistleblowing

Global Context: Work-Life Balance, DEIA at workplace, Cultural aspects, Concerns for Multinational Companies

Ethics and Society: Impact of Wars, Politics, and Religion on society; Understanding Privilege, Marginalisation, and Minorities; Ethico-economical Aspects: Fair Trade, Capitalism vs. Communism, Developed vs. Developing vs. Underdeveloped economies

TEXT BOOKS:

1. Ethics in Engineering, Mike W. Martin, Roland Schinzinger, McGraw-Hill Education, 2017 (ISBN: 978-9339204457)
2. Business Ethics: An Indian Perspective, A. C. Fernando, K. P. Muralidheeran, E. K. Satheesh, Pearson Education, 2019 (ISBN: 978-9353437442)
3. Professional Ethics, R. Subramanian, Oxford University Press, 2017 (ISBN: 978-0199475070)
4. Professional Ethics and Human Values, M. Govindarajan, S. Natarajan, V. S. Senthil Kumar, Prentice Hall India, 2015 (ISBN: 978-8120348165)

REFERENCES:

1. Engineering Ethics: Concepts & Cases, Charles E. Harris, Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2012 (ISBN: 978-8131517291)
2. Classical Indian Ethical Thought: A Philosophical Study of Hindu, Jaina and Bauddha Morals, Kedar Nath Tiwari, Motilal Banarsidass Publishers, 2017 (ISBN: 978-8120816084)
3. Ethics for the Whole World, Dalai Lama, 978-9351360803 Vijay Kumar Ivaturi et al., The Manual for Indian Start-Ups, Penguin Random House India, 2017 (ISBN: 978-0143428527), To Be Human, Jiddu Krishnamurti, Shambhala, 2000 (ISBN: 978-1570625961)
4. On Ethics and Economics, Amartya Sen, Oxford India, 1999 (ISBN: 978-0195627619)

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CE305) SMART CITIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand smart city basic concepts, global standards, and Indian context of smart cities
- To explain smart community, smart transportation and smart buildings
- To understand Energy demand, Green approach to meet Energy demand and their capacities
- To identify Smart Transportation Technologies in cities and concepts towards smart city

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain and elaborate smart city concepts and their international and national standards
CO-2: Conceptualize smart community, transportation and building concepts
CO-3: Develop and calibrate energy demand and their capacity limits
CO-4: Predict the various smart urban transportation systems and the transition from existing city towards a smart city

UNIT-I:
Introduction to Smart Cities: Introduction to Smart Cities - Understanding Smart Cities - Dimensions of Smart Cities – World urbanization, Global Experience of Smart Cities, Smart City case studies-Indian scenario - India "100 Smart Cities" Policy and Mission. City as a System of Systems- Systems thinking – Developing a smart city approach – Core elements of a smart city – Relevant open data for a smart city – Sustainability – Privacy and Ethics.

UNIT-II:
Smart Cities Planning and Development: Introduction to Smart Community; Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water - Cybersecurity, Safety, and Privacy; Internet of Things, Blockchain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT-III:
Smart Urban Energy Systems: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – a statistical analysis -Meeting energy demand through direct and indirect solar resources- Efficiency of indirect solar resources and its utility, Capacity.

UNIT-IV:

Smart Transportation Systems: Smart Transportation Technologies - Driverless and connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems – Relevant case studies

UNIT-V:

Future of Smart Cities: The transition of legacy cities to Smart - Right transition process - the benefit of citizens, cities have to adopt effective management and governance approaches-factors in the transition phase of legacy cities to Smart cities and their managerial implications.

TEXT BOOKS:

1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanagachidambaresan, R. Maheswar, V. Manikandan, K. Ramakrishnan., Springer, 2020
2. Society 5.0: A People-Centric Super-Smart Society, Hitachi-U Tokyo Laboratory (H-U Tokyo Lab), Springer, 2020
3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCES:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity Yu-min Joo, Yu-Min Joo, Teck-Boon Tan, Edward Elgar, 2020
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier, 2020

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EE303) TRENDS IN ENERGY SOURCES FOR SUSTAINABLE DEVLOPMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the role of sustainable energy
- To know components of solar PV and wind energy conversion systems
- To understand the principles of Biomass, geo-thermal and wave energy systems
- To learn various energy storage methods

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand various sources for sustainable energy
CO-2: Understand Solar Photo voltaic and wind energy systems
CO-3: Learnt the harnessing techniques of Biomass, geothermal and ocean energy
CO-4: Familiarize with energy storage methods

UNIT-I:
Introduction: Trends in energy consumption - Conventional and renewable sources, Energy sources and their availability, Energy Conservation status in India -need of new energies for sustainable development.

UNIT-II:
Fundamentals of Solar Radiation: Introduction-The Sun as Source of Energy, Extraterrestrial and Terrestrial Radiations, Spectral Power Distribution of Solar Radiation, instruments for measuring solar radiation and sunshine recorder.
Solar PV Conversion: The PV Cell-Crystalline Solar cells -Thin film and amorphous solar cells, Module, Array, Equivalent Electrical circuit- Open circuit voltage and Short circuit current, I-V, P-V Curves. Developments in efficient non silicon solar cells

UNIT-III:
Wind Energy: origin of winds-Global (or Planetary) Winds- Local Winds-Factors Affecting the Distribution of Wind Energy on the Surface of Earth, Wind Turbine – Types, construction of HAWT, VAWT, performance characteristics, Betz criteria.

UNIT-IV:
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Biogas digesters, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT-V:
Geothermal Energy: Resources, types of wells, methods of harnessing the energy Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic

cycles. Tidal and Wave Energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

Energy Storage: Electro Chemical Storage: lead-acid- nickel cadmium-nickel-metal-hydride and lithium type batteries-Principle of operation, Types, Advantages and disadvantages. Non-Electric Storage: Methods of Energy storage –Pumped Energy Storage – Compressed air Energy Storage, Superconducting Magnet Energy Storage.

TEXT BOOKS:

1. Non-Conventional Energy Sources, G. D. Rai, 6th Edition, Khanna Publishers, 2004
2. Non-Convention Energy Resources, B. H. Khan, 3rd Edition, McGraw-Hill, 2017

REFERENCES:

1. Renewable Energy Sources, Twidell & Weir, 3rd Edition, CRC Press, 2015
2. Solar Energy, Sukhatme, 3rd Edition, McGraw-Hill, 2008
3. Non-Conventional Energy, Ashok V. Desai, Wiley Eastern, 1990

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1ME303) 3D PRINTING AND DESIGN

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the need and know about the applications of 3D Printing
- To understand the need of liquid and solid based 3D Printing systems
- To know about the powder-based 3D Printing systems
- To understand the importance of CAD, post-processing and inspection involved in 3D Printing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Summarize the importance of 3D Printing and its applications
CO-2: Explain the process involved in liquid and solid based 3D Printing Systems
CO-3: Explain the powder-based 3D Printing systems
CO-4: Apply the knowledge of CAD, post-processing and inspection involved in 3D Printing

UNIT-I:
Introduction: Introduction to 3D Printing, Classification, 3D Printing Process Chain, Materials for 3D Printing, Distinction between 3D Printing & Conventional Manufacturing.
Applications: Brief overview of applications in Aerospace, Automotive, Biomedical, Defense, Construction, Jewelry, Coin and Tableware Industry, Artificial Intelligence & IOT in 3D Printing

UNIT-II:
Liquid Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Material Jetting and Stereolithography.

UNIT-III:
Solid Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Fused Deposition Modeling (FDM) and Laminated Object Manufacturing (LOM).

UNIT-IV:
Powder Based 3D Printing Systems: Introduction, Principle, Processes and Applications of Selective Laser Sintering (SLS), Three-Dimensional Printing (3DP).

UNIT-V:
CAD, Post Processing and Inspection for 3D Printing: CAD data formats, CAD model preparation, Part orientation and support generation, Overview of 3D Printing softwares - MAGICS and MIMICS.

Post Processing: Introduction, Post Processing Techniques like Support material removal, Cleaning, Sanding and Polishing.
Inspection: Introduction, Significance, Inspection techniques like Dimensional measurement along X, Y and Z axes, visual inspection of the surface finish (overall aesthetics and intact features), flatness or warp check, and FOD (foreign objects or debris) check.

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W. Rosen, Brent Stucker, Springer, 2010
2. Rapid Prototyping: Principles and Applications, Chua C. K., Leong K. F., and Lim C. S., 3rd Edition, World Scientific, 2010

REFERENCES:

1. Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development, Liou L. W. and Liou F. W., CRC Press, 2007
2. Rapid Prototyping: Theory and Practice, Kamrani A. K. and Nasr E. A., Springer, 2006
3. Rapid Tooling: Technologies and Industrial Applications, Hilton P. D. and Jacobs P. F., CRC Press, 2000
4. Rapid Prototyping, Gebhardt A. Hanser, Gardener Publications, 2003

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1ME304) ADVANCED MATERIALS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic Sciences

COURSE OBJECTIVES:
- To understand basic principles of advanced materials
- To understand the applications of all kinds of Industrial materials
- To select materials for given applications.
- To identify the need of developing Nano materials, smart materials, ceramics, glasses and non-metallic materials

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the concepts and principles of advanced materials
CO-2: Suggest the material for the applications of all kinds of Industrial components
CO-3: Understand the material selection concepts to select a material for a given application
CO-4: Understand the behaviour and applications of Nano materials, smart materials, ceramics, glasses and non-metallic materials

UNIT-I:
Classification and Selection of Materials: Classification of materials, properties required in Engineering materials, Selection of Materials; Motivation for selection, cost basis and service requirements - Selection for mechanical properties, strength, toughness, fatigue and creep - Selection for surface durability corrosion and wear resistance – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications.

UNIT-II:
Composite Materials: Fiber reinforced, laminated and dispersed materials with metallic matrix of aluminium, copper and Titanium alloys and with non-metallic matrix of unsaturated polyesters and epoxy resins. Important properties and applications of these materials.

UNIT-III:
Low & High Temperature Materials: Properties required for low temperature applications, Materials available for low temperature applications, Requirements of materials for high temperature applications, Materials available for high temperature applications, Applications of low and high temperature materials.

UNIT-IV:

Modern Metallic Materials: Dual Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Maraging Steel, Inter metallics, Ni and Ti Aluminides.

Non-metallic Materials: Polymeric materials, Fibers, Foams, Adhesives and Coatings, structure, Properties and Applications.

UNIT-V:

Smart Materials: Shape Memory Alloys, Varistors and Intelligent materials for bio-medical applications.

Nanomaterials: Definition, Types of nanomaterials including carbon nanotubes and nanocomposites, Physical and mechanical properties, Applications of nanomaterials.

TEXT BOOKS:

1. Materials Science and Engineering, W. D. Callister Jr., Wiley India, 2010
2. Engineering Design: A Materials and Processing Approach, G. E. Dieter, McGraw-Hill, 1991

REFERENCES:

1. Materials Selection in Mechanical Design, M. F. Ashby, Pergamon Press 1992
2. Introduction to Engineering Materials & Manufacturing Processes, NIIT Prentice Hall of India, 2003
3. Engineering Materials Properties and Selection, Kenneth G. Budinski, Prentice Hall of India, 1992
4. Selection of Engineering Materials, Gladius Lewis, Prentice-Hall, 1990

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC305) 5G/6G TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To learn air Interface for 5G as the most important elements that differentiate between 2G, 3G, 4G and 5G
- To study the concepts of 5G networks, technologies, and services
- To understand the concept of 5G NR and different 5G waveforms
- To study the basic principles of 6G networks

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the need for 5G and the Use cases for 5G
CO-2: Understand 5G architectural details
CO-3: Compare different 5G radio access technologies
CO-4: Analyse various modulation schemes for 5G
CO-5: Understand the evolution of 5g to 6G

UNIT-I:
Fundamentals of 5G Technology: Introduction, Historical trends of wireless communications, Evolution of LTE technology to beyond 4G, 5G roadmap, 5G Overview, Physical Layer Changes in 5G, Protocol changes in 5G, 5G Use cases.

UNIT-II:
5G Network Architecture: Introduction, 5G RAN architecture, 5G Core, EPC to 5GC, Main Functional Entities of the 5G Core, High-Level Features of 5G Core, Network Slicing, QoS, 5G Security.

UNIT-III:
Numerology and Slot Structure: Numerology and Slot Structure in 4G LTE, SCSs for 5G NR, frequency ranges, Bandwidths, and bands for 5G NR, Symbol, Slot, Subframe, and frame for 5G NR, slot structure for 5G NR.

UNIT-IV:
5G Radio-access Technologies: 5G Waveform, OFDM, Modulation and coding in 5G, Propagation Characteristics of 5G Channel models, MIMO communication essentials, Massive MIMO in 5G, Small cells, D2D, M2M

UNIT-V:
Evolution of 6G Systems: Evolution from 5G to 6G, 6G frequency bands, Bandwidths and data rates, channel models, OTFS orthogonal Time frequency Space, Rate split multiple access, NOMA for 6G, AI/ML model for 6G network optimization.

TEXT BOOKS:

1. Fundamentals of 5G Communications: Connectivity for Enhanced Mobile Broadband and Beyond Wanshi Chen, Peter Gaal, Juan Montojo, Haris Zisimopoulos, 2021
2. Fundamentals of 5G Mobile Networks Jonathan Rodriguez, Wiley

REFERENCES:

1. 5G Mobile and Wireless Communications Technology Afif Osseiran, Jose F. Monserrat, Patrick Marsch, Cambridge, 2nd Edition, University Press, 2011
2. 5G NR: The Next Generation Wireless Access Technology Erik Dahlman, Stefan Parkvall, Johan Skold, 1st Edition, Elsevier, 2016
3. Evolution of Air Interface towards 5G Prof. Suvra Sekhar Das Electrical and Electronics Engineering, IIT Kharagpur
4. Evolution of Air Interface for 5G, River Publishers, 2018

ONLINE RESOURCES:

1. https://www.theiotacademy.co/5G-6G-Talks

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EC306) FUNDAMENTALS OF VLSI

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To learn the fabrication process of integrated circuit and operation of MSO transistors
- To understand the electrical properties of MOS transistors
- To learn the basics of digital design
- To understand the design procedure of various digital circuits
- To study the concepts of stick diagrams and layouts with the knowledge of MOS layers

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand IC Fabrication process steps required for various MOS circuits
CO-2: Know the various electrical properties of MOS transistors
CO-3: Understand the importance of digital circuits in IC design.
CO-4: Design the various combinational and digital circuits.
CO-5: Design the circuits using CMOS logic style and understand the role of testing

UNIT-I:
Introduction to Integrated Circuit Technology: MOS Technologies, PMOS, NMOS, CMOS fabrication process. Basic MOS Transistors Operation - Enhancement and Depletion Mode Transistors, and VLSI Design Flow.

UNIT-II:
Basic Electrical Properties of MOS: Drain to Source Current equation, MOS transistor threshold voltage, Transconductance and Output conductance, figure of merit. Pass transistor, NMOS Inverter, CMOS Inverter.

UNIT-III:
Introduction to Digital Design: Binary Logic, Postulates and theorems, SOP and POS forms, digital logic gates, Karnaugh Maps –minimization using two variable, three variable and four variable K-Maps, Don't Care Conditions.

UNIT-IV:
Overview of Digital Circuits – Half Adder, Full Adder, Half subtractor and Full Subtractor, Ripple carry adder, fundamentals of Decoders, Encoders, Multiplexers.
Combinational Vs Sequential Circuits, Functionality of Flip Flops-RS flip flop, D flip flop, JK flip flop, T flip flop, Introduction to Registers and Counters.

UNIT-V:
Combinational MOS Logic Circuits: Primitive CMOS logic gates - NOR and NAND gate, Realizing Boolean expressions using CMOS gates.

VLSI Circuit Design Processes: MOS Layers, Stick Diagrams- nMOS and CMOS design styles. Layout Diagram for nMOS and CMOS inverters, Need for Scaling in VLSI, Testing Philosophy and Role of Testing in IC technology.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Douglas and A. Pucknell, PHI, 2005
2. Digital Design, M. Morris Mano, 3rd Edition, Pearson Education/PHI, 2003

REFERENCES:

1. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E. Weste, David Harris, Ayan Banerjee, 4th Edition, Pearson, 2015
2. Introduction to VLSI Systems: A Logic, Circuit and System Perspective, Ming-BO Lin, CRC Press, 2011
3. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits, M.L. Bushnell, V. D. Agrawal, Kluwer Academic Publishers, 2015

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS304) AI FOR BEGINNERS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand and analyze the basic concepts of artificial intelligence
- To identify, explore the complex problem-solving strategies and approaches
- To analyze the concepts of basic concepts of neural networks and learning process
- To explore and analyze the methodology used in machine learning and computer vision

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and apply the basic concepts of artificial intelligence and its use cases. lives
CO-2: Explore the various search strategies and approaches for problem solving
CO-3: Correlate the fields related to AI, and articulate various learning paradigms
CO-4: Describe several issues and ethical concerns surrounding AI

UNIT-I:
Introduction to AI: What is AI-On Overview, History of AI, Applications and Examples of AI, AI Concepts, Terminology, Key fields of AI. AI Issues, Concerns, and Ethical Considerations.

UNIT-II:
AI as Search Process: On overview of Search Strategy. Types of Searches- Uninformed, Informed, Bidirectional search, Heuristic search. Local search, Local beam search, Adversarial Search.

UNIT-III:
AI as Knowledge Exploration: Introduction to Propositional Logic, Rules of Inference, First Order Logic (FOL) Syntax, Semantics, Entailment, Tools to represent knowledge.

UNIT-IV:
AI as a Learning Task: Introduction to Learning, Learning types -Supervised, Unsupervised, Reinforcement Learning, Machine learning, Deep Learning, The link between AI, ML, DL.

UNIT-V:
AI as Neural Networks: Introduction to biological neural networks. Link between biological neuron and artificial neuron. Architecture of artificial neural network, Types of Neural networks-single layer, multilayer, Back propagation networks.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2010
2. Machine Learning, Tom M. Mitchell, McGraw-Hill Publications
3. Neural Networks-A Comprehensive Foundation, Simon Haykin, 2nd Edition, Pearson Education, 2004

REFERENCES:

1. Artificial Intelligence, Elaine Rich & Kevin Knight, 2nd Edition, Tata McGraw-Hill
2. Artificial Intelligence, A New Synthesis, Nils J. Nilsson, Elsevier
3. Artificial Neural Networks, Yegnanarayana B., PHI

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS309) BLOCKCHAIN TECHNOLOGY ESSENTIALS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce and get the technological overview of blockchain technologies
- To study the foundation of Blockchain Technology and demonstrate the various types of Blockchain
- To explore the application area of Blockchain Technology
- To introduce smart contract, consensus algorithm and Security Mechanism
- To introduce available platforms for implementing Blockchain Technology

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand and explore the Blockchain Technology
CO-2: Describe smart contract concepts
CO-3: Explore different types of Blockchain
CO-4: Develop the platforms to implement Blockchain Technology

UNIT-I:
Fundamental of Blockchain: Introduction to Centralized, Decentralized and Distributed system, computer network peer to peer connection, understanding of blockchain, History of Blockchain, Various technical definitions of Blockchain.
Generic elements of a Blockchain: Block, Transaction, Node, Why It's Called "Blockchain", Characteristics of Blockchain Technology, Advantages of blockchain technology, Limitations of blockchain as a technology, Applications of blockchain technology, Tiers of blockchain technology Blockchain 0, Blockchain 1, Blockchain 2, Blockchain 3, Generation of Blockchain X, Confidentiality, Integrity, Authentication

UNIT-II:
Concept of Blockchain Technology: Component of block, Structure of Block chain, Technical Characteristics of the Blockchain, genesis block, Nonce, architecture of blockchain applications, Types of blockchain: Public blockchain, private blockchain, hybrid blockchain, examples of Public, private, hybrid blockchain and it merit and demerit, Permissioned ledger, Distributed ledger, Shared ledger, Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains

UNIT-III:
Smart Contract, Byzantine Fault Tolerance (BFT), Byzantine generals problem, byzantine agreement problems, Cryptography, Hashing, Distributed database, Consensus mechanisms, and basic of Cryptographic primitives, Technical Characteristics of Secure Hash Algorithms (SHA), Digital signature, Consensus Algorithm: Proof of work (PoW), Proof-of-Stake (PoS), Proof of authority (PoA)

UNIT-IV:

Cryptocurrency, Digital currency, Bitcoin, Bitcoin definition, Keys and addresses, Public keys in Bitcoin, Private keys in Bitcoin, how bitcoin currency work, Ethereum, Ethereum network, either, Ethereum Nodes, Ethereum clients, transaction fees, Ethereum Virtual Machine, Various Cryptocurrency and differences.

UNIT-V:

Implementation Platforms: Hyperledger as a protocol, Reference architecture, Hyperledger Fabric, Transaction Flow, Hyperledger Fabric Details, Fabric Membership, Fabric Membership, Blockchain in AI, Blockchain in IoT, Blockchain in Cloud Computing.

TEXT BOOKS:

1. Mastering Blockchain, Imaran Bashir, 2nd Edition, Packt
2. Blockchain Basic, Daniel Drescher, A Press

REFERENCE:

1. Blockchain For Dummies®, IBM Limited Edition, John Wiley & Sons

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EI303) FUNDAMENTALS OF ROBOTICS AND DRONES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the basics of robots
- To classify various types of actuators, grippers and sensors
- To acquire knowledge on kinematics and vision systems used for different robots
- To acquire knowledge on the basics of drones

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Acquire knowledge on various types of Power Sources (actuators), sensors and grippers
CO-2: Acquire knowledge on different applications of various types of robots
CO-3: Analyze the direct and the inverse kinematic problems and calculate the manipulator Dynamics
CO-4: Acquire knowledge on the applications of machine vision in robotics
CO-5: Acquire Knowledge on the basics of drones

UNIT-I:
Basic Concepts: An overview of Robotics, classification of Robots, Robot Components, Robot degrees of freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.

UNIT-II:
Actuators, Grippers and Sensors
Actuators: Characteristics of activating system, comparison of activating system Hydraulic devices, Pneumatic devices, electric motors, magneto-strictive actuators.
Sensors & Grippers: Robot end effectors, Classification, drive system for Gripper, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks, Scoops. Sensor characteristics, Position sensors, velocity sensors, acceleration sensors, torque sensors, light and infrared sensors, touch and tactile sensors, proximity sensors, range finders.

UNIT-III:
Kinematics: Forward and reverse kinematics. Matrix representation of translational and Rotational motion – Homogeneous Transformation-DH representation of standard configuration Robots Inverse Kinematics. Joint space vs. Cartesian space-Basics of Trajectory planning in joint and Cartesian space.

UNIT-IV:
Robot Vision: Low level and High-level vision Image acquisition, Illumination Techniques, Imaging Geometry, Some Basic Relationships between Pixels,

Segmentation, Description, Segmentation and Description of 3-D Structures, Recognition, Interpretation.

UNIT-V:

Basics of Drones: Theory behind how drones work, individual components that makeup a drone, basic concepts involved radio-controlled model flying, building a complete quad copter drone from scratch.

TEXT BOOKS:

1. Introduction To Robotics: Analysis, Control, Applications, Saeed B. Niku, 2nd Edition, Wiley
2. Industrial Robotics, Technology Programming and Applications, Mikell P. Groover, Nicholas G. Odrey, Mitchel Weiss, Roger N. Nagel, Ashish Dutta, McGraw-Hill, 2012

REFERENCES:

1. Robotics Technology and Flexible Automation, Deb S. R., John Wiley
2. Robots and Manufacturing Automation, Asfahl C. R, John Wiley
3. Robotic Engineering–An Integrated Approach, Klafter R. D., Chimielewski T. A., Negin M., Prentice Hall of India
4. Drones for Beginners, Udemy

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT305) INTRODUCTION TO CLOUD COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To impart the basics of cloud computing for business management
- To illustrate and explore the benefits of cloud storage and its applications, usage by managers
- To cloud computing driven real time systems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the characteristics and models in Cloud computing
CO-2: Asses Cloud services applications and the challenges associated with Cloud Computing
CO-3: Apply various cloud services and deployment models and virtualization techniques for business
CO-4: Analyze the concepts of cloud storage and demonstrate their use
CO-5: Evaluate various cloud programming models and apply them in virtual office management

UNIT-I:
Cloud Computing Overview: Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling , Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT-II:
Cloud Insights: Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability, simplicity, vendors, security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-III:
Cloud Architecture- Layers and Models: Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-IV:
Cloud Simulators - CloudSim and Green Cloud: Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim,

GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud.

UNIT-V:

Introduction to VMWare Simulator: Basics of VMWare, advantages of VMware virtualization, using VMware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

TEXT BOOK:

1. Cloud computing a practical approach, Anthony T.Velte , Toby J. Velte Robert Elsenpeter, Tata McGraw-Hill, 2010

REFERENCES:

1. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Michael Miller – Que, 2008
2. Cloud Computing for Dummies, Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, Wiley Publishing, 2010
3. Cloud Computing (Principles and Paradigms), Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, 2011

ONLINE RESOURCE:

1. https://onlinecourses.nptel.ac.in/noc24_cs17/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1IT306) FUNDAMENTALS OF COMPUTER VISION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the fundamental concepts related to multi-dimensional signal processing
- To understand feature extraction algorithms
- To understand visual geometric modeling and stochastic optimization

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Recognize the basic fundamentals of vision and describe the scope of challenges
CO-2: Develop algorithms to analyze feature detection and feature alignment
CO-3: Analyze images and videos for problems such as tracking and structure from motion
CO-4: Choose object, scene recognition and categorization algorithms for real time images
CO-5: Apply various techniques to build computer vision applications

UNIT-I:
Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations, Photometric image formation, Digital Camera image formation.
Image Processing: Point operators, linear filtering, more neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations.

UNIT-II:
Featured Etection and Matching: Points and patches, Edges, Lines.
Segmentation: Active contours, Split and merge, Mean shift and modefinding, Normalized cuts.
Feature-based Alignment: 2D and 3D feature-based alignment, Pose estimation.

UNIT-III:
Structure from Motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, constrained structure and motion.
Densemotion Estimation: Translational alignment, parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT-IV:
Image Stitching: Motion Models, Global alignment, Sparse and dense corresponding, Global Optimization.

UNIT–V:

Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

TEXT BOOKS:

1. Computer Vision: Algorithms and Applications, Richard Szeliski, Springer-Verlag, 2011
2. Digital Image Processing, R. C. Gonzalez and R. E. Woods, Addison Wesley, 2008

REFERENCES:

1. Pattern Recognition: Statistical. Structural and Neural Approaches, Robert J. Schallkoff, John Wiley and Sons, 1992
2. Computer Vision: A Modern Approach, D. A. Forsyth and J. Ponce, Pearson Education, 2003
3. Multiple View Geometry, R. Hartley and A. Zisserman, Cambridge University Press, 2002
4. Multiple View Geometry in Computer Vision, Richard Hartley and Andrew Zisserman, 2nd Edition, Cambridge University Press, March 2004
5. Introduction to Statistical Pattern Recognition, K. Fukunaga, 2nd Edition, Academic Press, Morgan Kaufmann,1990

ONLINE RESOURCE:

1. https://onlinecourses.nptel.ac.in/noc24_ee38/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1AE303) INTRODUCTION TO ADVANCED VEHICLE TECHNOLOGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the layout of an automobile and functionality of chassis elements
- To know the working of automotive engine and electrical systems
- To provide the concepts of electric and hybrid vehicles
- To present various intelligent automotive systems and levels of vehicle autonomy

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the functionalities of automotive systems and subsystems
CO-2: Describe the working of automotive engine and electrical systems
CO-3: Summarize the concepts of electric and hybrid vehicles
CO-4: Discuss various intelligent automotive systems
CO-5: Review the levels of vehicle autonomy and communication

UNIT-I:
Introduction: Classification of automobiles, layout of an automobile and types of bodies.
Automotive Chassis: Introduction to chassis systems - engine, cooling, lubrication, fuel feed, ignition, electrical, driveline - clutch, transmission, propeller shaft, differential, axles, wheels and tyres, steering, suspension and braking.

UNIT-II:
Engine: Working principle of four stoke and two stroke SI and CI engines, fuel system – layout of petrol and diesel fuel systems, electronic fuel injection - multi-point fuel injection, gasoline direct injection and common rail direct injection.
Electrical System: Simple automotive wiring diagram, components of electrical system and functionality.

UNIT-III:
Electric and Hybrid Vehicles: Electric vehicle – layout, components, configurations, advantages and limitations. Hybrid vehicle - concepts of hybrid electric drivetrain based on hybridization and powertrain configuration, architecture of series, parallel and series-parallel hybrid electric drivetrains, modes of operation, merits and demerits.

UNIT-IV:
Intelligent Vehicle Systems: Automotive navigation, night vision, head-up display, airbag, seat belt tightening system, immobilizers, adaptive cruise control, forward collision warning, lane departure warning and anti-lock braking system.

UNIT-V:

Autonomous Vehicles: Levels of automation, research, challenges, commercial development, sensor systems, sensor suits, environmental challenges, graceful degradation, V2V and V2I communication, sharing the drive, integrity, security, verification and policy implications.

TEXT BOOKS:

1. Advanced Vehicle Technology, Heinz Heisler, Butterworth Heinemann, 2002
2. Intelligent Vehicle Technologies: Theory and Applications, Ljubo Vlacic, Michel Parent and Fumio Harashima, Butterworth-Heinemann, 2001
3. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, CRS Press, 2004

REFERENCES:

1. Automotive Mechanics, Giri N. K., Khanna Publications, 2006
2. Automotive Electrical Equipment, Kohli P. L., Tata McGraw-Hill Co.,1975
3. Electric and Hybrid Vehicles – Design Fundamentals, Iqbal Husain, CRC Press, 2010
4. Autonomous Vehicle Technology-A Guide for Policymakers, James M. Anderson, Nidhi Kalra, Karlyn D. Stanley, Paul Sorensen, Constantine Samaras, Oluwatobi A. Oluwatola, RAND Corporation, Santa Monica, 2016

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee112/preview
2. https://www.classcentral.com/subject/autonomous

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS310) INTRODUCTION TO APPLICATION DEVELOPMENT WITH C#

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To create an integrated development environment for object-oriented C# programs
- To build website menus with CSS and JavaScript
- To relate programming language constructs and problem solving techniques
- To analyze and Apply modifications to C# programs that solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS
CO-2: Create web pages and add dynamic behavior to web pages using Javascript
CO-3: Communicate with the database using SQL
CO-4: Develop a simple CUI [Character User Interface] based application using C# & SQL

UNIT-I:
Computer, Software Engineering Fundamentals & OOP: Introduction to Computer Basics, Basics of Network, Networking Levels and Layers and Protocols, Protocol Stacks, Networking and Internet Service, Software Engineering Fundamentals - Overview of Requirement Analysis, Overview of Software Design, Overview of Software Implementation, Overview of Testing, Overview of Software Maintenance, Overview of Configuration management and version Control, Agile Basics, OOP - Object Oriented Concepts, Objects and Classes, Principles in Object- Oriented technology
Use Case: Create a class for BankAccount

UNIT-II:
HTML & CSS: Introduction to Web Technology, Introduction to HTML5, HTML5 Elements, Semantic Elements, Table, List, Working with Links, Image Handling, Form-Input Elements, HTML5 Form elements, HTML5 Attributes, Video & Audio, iframes, CSS - Introduction to CSS3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Different color schemes, CSS Borders, CSS Margins, CSS Backgrounds
Use Case: Create a website for college

UNIT-III:
JavaScript, RDBMS Concepts and SQL: JavaScript basics, Functions in Javascript, Javascript validation, Events, Javascript event handling, JavaScript Strings, JavaScript Dates, Array in Javascript, Document Object Model (Window, Frame, Navigator Objects), Working with Document Object (Its Properties and methods, Cookie

handling), Introduction to RDBMS Concepts, Introduction to SQL, Creating and Managing Tables, Data Manipulation, Basic SQL SELECT Statements, Scalar & Aggregate Functions, Joins & Subqueries, Views & Index

Use Case: Apply validations for Telephone Complaint Registration Form

Use Case: Create student table for College Management System(CMS)

UNIT-IV:

Introduction to C# Programming: Introduction to .NET Framework 4.5 - What is .NET Framework, .NET Framework, Languages, and Tools, .NET Framework Major Components, Common Language Runtime (CLR), Compilation and Execution in .NET, Understand the .NET Framework 4.5stack, Exploring VS2017, Introduction to C# 6.0 - Features of C#, C# Compilation and Execution, General Structure of a C# Program, Creating and Using a DLL

Use Case: Create a Console Application (.exe) project called CalcClientApp

UNIT-V:

Language Fundamentals of C#: Language Fundamentals - Keywords, Value Types and Reference Types, Implicit and explicit type conversions, Boxing and Unboxing, Enum, Operators and Assignments, Variables and Literals, Flow

Control: C# Control Statements, Nullable, Classes and Objects, Strings, Array, Generic Collections

Use Case: Store employee objects using Generic Collections

Basics of ADO.NET: Various Connection Architectures, Understanding ADO.NET and its class library, Important Classes in ADO.NET, Connection Class, Command Class, DataReader Class, DataAdapter Class, DataSet Class

Use Case: Implement ADO.NET classes that belong to both Connected and Disconnected Architectures

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C. J. Date, Pearson Education
3. Professional C# 2012 with .NET 4.5, Christian Nagel et al. Wiley India, 2012

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Pro C# 2010 and the .NET 4 Platform, Andrew Troelsen, 5th Edition, A Press, 2010
5. Programming C# 4.0, Ian Griffiths, Matthew Adams, Jesse Liberty, 6th Edition, O"Reilly, 2010

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS311) INTRODUCTION TO APPLICATION DEVELOPMENT WITH JAVA

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To build website menus with CSS and JavaScript
- To create a bank account using class and keep track of customers data
- To create and store employee objects using collection framework
- To analyze and apply menu driven program using JDBC to save, delete, update
- To create an integrated development environment for object-oriented Java programs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS
CO-2: Create customers data who are buying products using Classes and Objects
CO-3: Understand the Collection Framework concepts and its implementation
CO-4: Communicate with the database using SQL
CO-5: Develop a simple CUI [Character User Interface] based application using Java & SQL

UNIT-I:
HTML: Introduction to Web Technology, HTML5 Introduction, HTML5 Elements, Semantic Elements, Table, List, Links in HTML5, Handling of Images, Form Elements, HTML5 Form elements and Attributes, Video & Audio, iframes
Style Sheets: Introduction to CascadingStyleSheet3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Color schemes, CSS Borders, CSS Margins, CSS Backgrounds
Use Case: Design a website for college
JavaScript: Introduction to JavaScript, JavaScript Functions, JavaScript validation, Event handling in JavaScript, JavaScript Strings, JavaScript Dates, Array in JavaScript, Document Object Model (Window, Frame, Navigator Objects), Document Object (Its Properties and methods, Cookie handling),

UNIT-II:
Introduction to Java: Java Environment, Java Fundamentals - Keywords, Primitive Data Types, Operators and Assignments, Java's Control Statements, Wrapper Classes, Using Scanner Class,
Object Oriented Programming: Object Oriented Paradigm, Classes and Objects, Principles in Object- Oriented technology
Use Case: Create a class for Bank Account
Strings: String Handling functions, Array - One dimensional array, Array of Objects, Using Arrays class, variable length arguments

Use Case: To keep track of customers data who are buying products from a store

UNIT-III:
The Collection Framework: Lists – Array List, LinkedList, Stack, Vector, Set – HashSet, Linked Hash Set, Tree Set, Map – HashMap, Linked HashMap, Hash table. Retrieving Elements from Collections – Enumeration, Iterator, List Iterator, String Tokenizer – Sorting using Comparable and Comparator.
Use Case: Store employee objects using collection framework

UNIT-IV:
JDBC: Overview of JDBC, JDBC Architecture, Types of JDBC Drivers. Process SQL with JDBC - Create Connection, Query, Update
Use Case: Write the menu driven program using JDBC which will have following options
a. Store
b. Display by id
c. Delete by id
d. Update salary by id
e. Exit
RDBMS Concepts and SQL: Introduction to RDBMS Concepts, Introduction to SQL, Creating and Managing Tables, Data Manipulation, Basic SQL SELECT Statements, Scalar & Aggregate Functions, Joins & Subqueries, Views & Index
Use Case: Check the validations for Telephone Complaint Registration Form
Use Case: Create student table for College Management System (CMS)

UNIT-V:
Computer: Computer Fundamentals, Preface to Networks, Networking Levels, Layers of Computer Networks, Protocol Stacks, Networking, and Internet Service
Software Engineering Fundamentals: Introduction, Requirements Collection & Analysis, Fundamentals of Software Design, Software Implementation, Types of Testing, Software Maintenance, Overview of Configuration management and version Control Tools, Basics of Agile Process

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C. J. Date, Pearson Education
3. Big Java, Cay Horstmann, 2nd Edition, John Wiley and Sons

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Java How to Program, H. M. Dietel and P. J. Dietel, 6th Edition, Pearson Education/PHI

5. Core Java 2, Vol. 1, Fundamentals, Cay S. Horstmann and Gary Cornell, 7th Edition, Pearson Education

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CS312) INTRODUCTION TO APPLICATION DEVELOPMENT WITH PYTHON

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To create an integrated development environment for object-oriented Python programs
- To build website menus with CSS and JavaScript
- To relate programming language constructs and problem solving techniques
- To analyze and Apply modifications to Python programs that solve real-world problems

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the fundamentals of HTML5 and define the styles for web pages using CSS
CO-2: Create web pages and add dynamic behavior to web pages using Javascript
CO-3: Communicate with the database using SQL
CO-4: Develop a simple CUI [Character User Interface] based application using Python & SQL

UNIT-I:
Concepts of Networks, Overview of Software Engineering & OOP: Computer Basics, Network basics, Networking Levels, Layers and Protocols, Protocol Stacks, Networking and services of Internet
Software Engineering lifecycle - Overview of Requirement Analysis, Software Design, Implementation of software, Outline of Testing, Maintenance, Configuration management and version Control, Agile fundamentals
OOP - Object Oriented Concepts, OOP Principles
Use Case: Create a class for Employee Account

UNIT-II:
Introduction to Web Technology: Overview of Web Technology, Introduction to HTML5, HTML5 Elements, Semantic Elements, Table, List, Links, Image Handling, Form-Input Elements, HTML5 Form elements, HTML5 Attributes, Video & Audio, iframes,
CSS - Introduction to CSS3, CSS Syntax, CSS Styling, Text and Fonts properties, CSS Selectors, Different color schemes, CSS Borders, Margins, Backgrounds
Use Case: Create a website for an institution

UNIT-III:
Outline of JavaScript, RDBMS Concepts and SQL: JavaScript basics, Functions, validations, Events, handling events, Strings, Dates, Arrays, DOM (Window, Frame, Navigator Objects), Document Object -Properties and methods, handling of Cookies,

RDBMS Concepts, SQL, Management of Tables, Manipulation of tables, SQL SELECT Statements, Scalar & Aggregate Functions, Joins &Sub queries, Views & Index

Use Case: Apply validations for Telephone Complaint Registration Form

Use Case: Create student table for College Management System (CMS)

UNIT-IV:

Introduction to Python: Introduction, Features of Python, Versions, Keywords and Identifiers, Statements & Comments, Variables, Datatypes, Type Conversion, I/O and import, Language Fundamentals - Operators, Namespace, Modules in Python, Python DateTime

Classes and Objects: Classes and Objects in Python? Advantages of Using Classes in Python, Defining a Class in Python, Creating an Object in Python, The self, The_init_() function in Python, class and instance variables, Python Inheritance and its Types,

Use Case: Develop an application using Python for accepting your personal details and display the same

Use Case: Store employee objects using various data structures

UNIT-V:

Advance Concepts in Python: Strings, Lists, Sets, Tuples, Dictionary .

Array - What is an Array, Difference between Array and List in Python, Creating an Array, Accessing a Python Array Element, Basic Operations of Arrays, Functions - Creating a Function, Calling a Function, Pass by reference vs value, Required arguments, Keyword arguments, Default arguments, Variable-length arguments, The Anonymous Functions, The return Statement, Global vs. Local variables, Modules - What is a Module?, Create a Module, Use a Module, Variables in Module, Naming a Module, Renaming a Module, Built-in Modules, Using the dir() Function, Import From Module, Packages, NumPy

Use Case: Develop an application for Hospital Management System(HMS)

TEXT BOOKS:

1. Web Programming, Building Internet Applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Introduction to Database Systems, C. J. Date, Pearson Education
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

REFERENCES:

1. Programming World Wide Web, Sebesta, Pearson
2. Internet and World Wide Web – How to Program, Dietel and Nieto PHI/Pearson Education Asia
3. Database Development and Management, Lee Chao, Auerbach Publications, Taylor & Francis Group
4. Core Python Programming, W. Chun, Pearson
5. Introduction to Python, Kenneth A. Lambert, Cengage

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT304) NUMERICAL ANALYSIS AND LINEAR PROGRAMMING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Differentiation, Integration, Basic concepts of Linear Algebra

COURSE OBJECTIVES:
- Solving numerical methods for non linear equations
- Applying various methods of interpolation and their application
- Evaluating definite integrals and solve Ordinary Differential Equations
- Formulating of Linear Programming Problem and of approaches of optimization techniques
- Applying different methods to solve the transportation problem

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply the numerical methods to find roots of algebraic and transcendental equations
CO-2: Interpolate the polynomial function using finite difference methods
CO-3: Solve the ordinary differential equations using various numerical techniques
CO-4: Model the Linear Programming Problem and estimate the feasible solutions
CO-5: Apply optimization techniques in industrial optimization problems

UNIT-I:
Solutions of Non-Linear Equations: Introduction; Mathematical preliminaries; Solution of algebraic and transcendental equation –bisection method, the method of false position, Fixed point iterative method, Newton - Raphson method, and their order of convergence

UNIT-II:
Interpolation: Introduction; Finite differences; Forward differences; Backward differences; Central differences; Differences of a polynomial; Newton's formulae for interpolation; Central difference interpolation formulae; Gauss's central difference formulae and Lagrange's and Hermite interpolation formulae

UNIT-III:
Numerical Integration: Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule, Gaussian quadrature 2 & 3 point formulae.
Numerical Solutions of Ordinary Differential Equations: Solution of initial value problems by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's method and 4th order Runge – Kutta method, Predictor Corrector methods - Adams Bash forth method- Adams Moulton method (without proof).

UNIT-IV:

Linear programming: Basic concepts, problem formulation, Concept of Duality, Dual of given Linear Programming Problem, canonical and standard forms of Linear Programming Problem, simplex method, Solutions to Linear Programming Problem by Dual Simplex Method, Artificial variables technique- Big-M method

UNIT-V:

Transportation problems: Balanced and Unbalanced transportation problems- North-West corner rule, Least Cost Method, Vogel's Approximation Method (VAM) and MODI method.

TEXT BOOKS:

1. Higher Engineering Mathematics, B. V. Ramana, 33rd Reprint, McGraw-Hill Education, 2018
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa Publications, 2016
3. Operations Research, Kanti Swarup, P.K. Gupta and ManMohan, 13th Edition, Sultan Chand and Sons, 2007

REFERENCES:

1. Operations Research, Theory and Applications, J. K. Sharma, 6th Edition, Trinity Press, Laxmi Publications, 2016
2. Advanced Engineering Mathematics, Erwin Kreyszig, 8th Edition, John Wiley
3. Elementary Numerical Analysis – an algorithmic approach -Samuel D. Conte and Carl De Boor, 3rd Edition, Tata McGraw-Hill, 2006
4. Operations Research: An introduction, Taha H. A., 7th Edition, Pearson Prentice Hall, 2002
5. Introduction to Operations Research, Hillier and Lieberman, 8th Edition, McGraw-Hill

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MT305) OPTIMIZATION TECHNIQUES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Basic knowledge of Calculus and Linear Algebra

COURSE OBJECTIVES:
- To understanding concepts of convex sets, convex functions
- To derivative based and derivative free optimization
- To formulating LP problem, solution of LP and feasibility of solutions
- To applying different methods to solve the transportation problem
- To understanding network-based optimization technique

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explore and understand role of convex functions in optimization problems
CO-2: Derive the Karush-Kahn-Tucker(KKT) optimality conditions for constrained optimization problem
CO-3: Formulating of Linear Programming Problem and of approaches of optimization techniques
CO-4: Apply optimization techniques in industrial optimization problems
CO-5: Learn the role modern tools in optimization problems

UNIT-I:
Optimization Basics: Review of calculus: Derivatives, Gradient, Convex sets, convex functions, Optimization, Basics of Optimization Problems: Representation, Local and Global minima, Conditions of Optimality, Newton's method, Gradient Method (Gradient Descent Method) and Steepest Descent Method of finding optimality with Numerical Examples

UNIT-II:
Constrained Optimization: Constrained optimization problem formulation, Equality and Inequality constraints problems with numerical examples, Tangent space and normal space, Lagrange's Theorem, Karush-Kahn-Tucker (KKT) condition, convex optimization.

UNIT-III:
Linear programming: Basic concepts, problem formulation, Concept of Duality, Dual of given Linear Programming Problem, canonical and standard forms of Linear Programming Problem, simplex method, Solutions to Linear Programming Problem by Dual Simplex Method, Artificial variables technique- Big-M method

UNIT-IV:

Transportation Problems: Balanced and Unbalanced transportation problems- North-West corner rule, Least Cost Method, Vogel's Approximation Method (VAM) and MODI method.

UNIT-V:

Genetic and Evolutionary Optimization: Introduction, Genetic Algorithms: Representation, Chromosomes and Genes, Generations; Fitness, Genetic Algorithms: selection, crossover, mutation, elitism with numerical examples, Multi-Objective Optimization

TEXT BOOKS:

1. Operations Research, Kanti Swarup, P. K. Gupta and Man Mohan, 13th Edition, Sultan Chand and Sons, 2007
2. Optimization Techniques: An Introduction, L. R. Foulds, Undergraduate Texts in Mathematics (UTM)
3. Optimization Insights and Applications, Jan Brinkhuis and Vladimir Tikhomirov

REFERENCES:

1. Optimization Methods for Engineering Design: Applications and Theory, Alan R. Parkinson, Richard J. Balling, John D. Hedengren, Brigham Young University
2. Optimization Toolbox: MATLAB User's Guide
3. Numerical Recipes in C: The Art of Scientific Computing, William H. Press, Saul A. Teukolsky, William T. Vetterling and Brian P. Flannery
4. Engineering Optimization: Theory and Practice, S. S. Rao

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1PH301) NANOSCIENCE AND TECHNOLOGY FOR ENGINEERS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic principles of quantum physics and nanoscience
- To study size dependent properties of materials at nanoscale and carbon nano tubes
- To explore various fabrication techniques for nanomaterials
- To ascertain different characterization techniques to analyze nanomaterials
- To extend applications of nanomaterials in engineering

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explain the basic principles of nanoscience
CO-2: Realize the importance of size dependent properties of nano materials
CO-3: Apply various fabrication techniques for nanomaterials
CO-4: Identify suitable characterization techniques to analyze nanomaterials
CO-5: Illustrate the applications of nanomaterials in engineering

UNIT-I:
Basics of Nanoscience: Introduction to quantum mechanics, electron as wave, Schrodinger time independent wave equation, particle in a potential box, Heisenberg Uncertainty Principle, Pauli's exclusion principle, Idea of band structure, density of states for zero, one, two, and three-dimensional materials (Qualitative), Quantum confinement, Quantum wells, wires, dots.

UNIT-II:
Properties of Nanomaterials: Surface to Volume ratio, Size dependent properties- Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties of nanomaterials, Electrical and Mechanical properties of Carbon nanotubes.

UNIT-III:
Fabrication Techniques of Nanomaterials: Physical methods- Ball milling, electron beam lithography, Sputtering, Laser ablation. (construction, working, advantages and disadvantages).
Chemical Methods: Sol-gel method, Chemical vapor deposition, Hydrothermal, Co-Precipitation. (construction, working, advantages and disadvantages).

UNIT-IV:
Characterization of Nanomaterials: XRD, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy, UV-VIS spectroscopy, Raman spectroscopy.

UNIT-V:

Nanomaterials in Engineering: Nano sensors-gas and chemical, Introduction to Nano Electro Mechanical Systems (NEMS), Applications of Nanomaterials in Drug delivery, Coatings, and Renewable energy.

TEXT BOOKS:

1. Nanotechnology: Principles & Practicals, Sulbha K. Kulakarni, Capital Publishing
2. Nano: The Essentials, T. Pradeep, McGraw-Hill Education
3. Nanostructures & Nanomaterials Synthesis, Properties & Applications, Guozhong Cao, Imperial College Press

REFERENCES:

1. Essentials of Nanoscience and Nanotechnology, Katta Narsimha Reddy
2. Introduction to Nanotechnology, C. P. Poole Jr. and F. J. Ownes, Wiley Student Edition
3. Nanoscience and Technology: Novel Structure and Phenomena-Ping and Sheng

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1PH302) ESSENTIALS FOR QUANTUM COMPUTING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To recall the basic principles of quantum physics
- To study various mathematical tools required for quantum computing
- To ascertain matrix representation and commutative relations of various operators
- To understand concept of qubit and its measurement
- To explain various types of quantum gates

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Recognize the importance of quantum mechanics
CO-2: Identify various operators for quantum computing
CO-3: Represent matrices and commutative relations
CO-4: Realize the concept of qubit and its measurement
CO-5: Apply different quantum gates in quantum computing

UNIT-I:
Basics of Quantum Mechanics: Introduction to quantum mechanics, Schrodinger time dependent and independent wave equation, Particle in a potential box, Heisenberg Uncertainty Principle, Pauli's exclusion principle, Quantum harmonic oscillator Linearity and Superposition.

UNIT-II:
Mathematical Tools for Quantum Computing-I: Linear vector space, Hillbert space, Dirac notation, Operators- Linear operator, Hermitian operators, Skew Hermitian operator, Inverse and Unitary operator, Eigen value and Eigen vector of operator, Unitary transformation and its properties.

UNIT-III:
Mathematical Tools for Quantum Computing-II: Matrix representation of Kets, Bras, Operators, Eigen values and Eigen vectors of matrices, Position representation, Momentum representation and their connection, Position and Momentum Operators and their commutation relations, Probability density and Expectation values.

UNIT-IV:
Fundamentals of Quantum Computing: Introduction to Quantum Computing, Types and Uses of Quantum Computers, Entanglement, Interference and Coherence/decoherence, Qubits, Representation and measurements of qubits.

UNIT-V:
Quantum Gates: Basic quantum logic gates. The Bloch sphere (Qualitative), Quantum States and Registers, Single Qubit gates, Hadamard Gate, Pauli Gates, Phase gate (S) and (T), Multi Qubit Gates, CNOT Gate.

TEXT BOOKS:

1. Quantum Mechanics- Concepts and Applications, Nouredine Zettili, Wiley
2. Quantum Computing: Beginners Introduction, Parag K. Lala, McGraw-Hill
3. Quantum Computation and Quantum Information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press

REFERENCES:

1. Introduction to Quantum Mechanics, D. J. Griffiths, Cambridge University Press
2. Molecular Quantum Mechanics, Peter Atkins, Ronald Friedman, Oxford University Press
3. Quantum Computing- A Gentle Introduction, Eleanor Rieffel and Wolf Gang Polak, The MIT Press Cambridge, Massachusetts London

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CH301) INTRODUCTION TO CLIMATE CHANGE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To introduce the concept of climate change and its historical context
- To analyze the ecological consequences of climate change Impacts
- To explore strategies for adaptation & mitigation of climate change
- To understand the global climate change models and predictions
- To examine international and national climate policies, and the challenges associated with climate change governance

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify natural and anthropogenic drivers of climate change
CO-2: Assess the impacts of climate change on environment
CO-3: Appraise various adaptation & mitigation options, for effective climate management
CO-4: Analyse climate models and adaptability of AI and IOT
CO-5: Evaluate the effectiveness of climate policies and assess the importance of technological innovations

UNIT-I:
Basics of Climate Change: Introduction & causes of climate change.
Natural Drivers: volcanoes, change in earth's orbit, solar variations & ocean currents.
Anthropogenic Drivers: greenhouse gas emissions, aerosols & land use. Key climate variables - temperature, precipitation, sea level. Human footprint on global warming.

UNIT-II:
Impact and Vulnerabilities: Climate change impacts on: water resources, wetlands, glaciers melting, biodiversity, agriculture, marine environment – (sea level rise, ocean current and circulation, ocean acidification, coastal lives) and human health - case studies.

UNIT-III:
Mitigation & Adaptation Strategies: Renewable energy technologies (solar, wind, hydro, geothermal & biomass), energy efficiency measures, carbon capture and storage (CCS). Policy frameworks (Kyoto Protocol, Paris Agreement). Adaptation strategies (resilient infrastructure, climate-smart agriculture & urban planning).

UNIT-IV:
Climate Models and Projections: Basics of climate modelling. Historical climate data analysis (past, present and future). General Circulation Models (GCMs), emission scenarios, Representative concentration pathways (RCPs), uncertainty in climate

projections, regional climate modelling, impacts on ecosystems and society. Fundamentals of AI & IOT for climate modelling.

UNIT-V:

Climate Policy and Governance: Global climate change governance, Climate change finance sources: challenges and opportunities to assess and manage Climate finance. Evaluate climate change policies: UNFCC and other entities. Climate negotiations, National scenario; in NAPCC, India's commitments (INDCs) and National communication (NATCOM). Initiative policies and regulation: Important agencies and organizations,

TEXT BOOKS:

1. Climate Change: A Multidisciplinary Approach, Anindita Bhadra and Navroz K. Dubash, 1st Edition, Sage Publications, 2019
2. Climate Change and India: Vulnerability Assessment and Adaptation, Arvind Kumar and Shalini Sharma, 1st Edition, Springer, 2019
3. Climate Change Governance and Adaptation: Case Studies from South Asia, Amalendu Jyotishi et al., 1st Edition, Routledge India, 2019

REFERENCES:

1. Climate Change: A Very Short Introduction, Mark Maslin, 4th Edition, Oxford University Press, 2019
2. Climate Change and Biodiversity in India, M. S. Manohar Rao and P. V. Sridhar Rao, 1st Edition, Universities Press, 2019
3. Climate Change: What Everyone Needs to Know, Joseph Romm, 2nd Edition, Oxford University Press, 2018
4. Climate Change: Impacts, Adaptation, and Vulnerability, Intergovernmental Panel on Climate Change (IPCC), 1st Edition, Cambridge University Press, 2007
5. Introduction to Modern Climate Change, Andrew Dessler and Edward Parson

ONLINE RESOURCES:

1. Coursera: Climate Change: The Science
2. edX: Climate Action: Solutions for a Changing Planet
3. Coursera: Climate Change Policy and Public Health

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1CH302) SUSTAINABLE CHEMISTRY FOR ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To explore the principles and applications of sustainable chemistry
- To emphasize the importance of green chemistry in addressing environmental challenges
- To introduce sustainable materials for green practices
- To provide comprehensive understanding of sustainable energy technologies
- To promote sustainable development practices aiming towards societal needs

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Identify the role of chemistry in promoting sustainability
CO-2: Familiarize with the concept of green chemistry and emphasize on LCA
CO-3: Interpret the importance of sustainable materials & green manufacturing
CO-4: Analyse and implement sustainable energy solutions
CO-5: Integrate technology for sustainable practices

UNIT-I:
Introduction to Sustainable Chemistry: Overview of sustainability concepts and principles, the role of chemistry in promoting sustainability, Sustainable development goals and their relation to chemistry (SDGs) -Zero hunger, good health & wellbeing, clean water and sanitation, affordable & clean energy, Industry, innovation & infrastructure, sustainable cities & communities, responsible consumption & production, climate action, life below water, life on land, partnerships for the goals. Case studies on sustainable chemistry practices.

UNIT-II:
Green Chemistry Principles & Applications: Definition & scope of green chemistry, Relation between green chemistry & sustainability, 12 Principles of green chemistry, Applications of green chemistry. Introduction to Life Cycle Assessment (LCA) methodologies - ISO14040, ISO14044, Cradle to grave, cradle to gate and cradle to cradle. Application of LCA to engineering processes and products.

UNIT-III:
Sustainable Materials & Green Manufacturing: Introduction to sustainable materials, criteria for evaluating the sustainability of materials. Impact of sustainable materials on environment. Eco friendly materials and their applications in packaging, construction, and consumer goods. Integration of smart materials into sustainable design. Green manufacturing-Definition & significance, emerging technologies for sustainable & green manufacturing. Industry 4.0 and its impact on green practices.

UNIT-IV:

Sustainable Energy Technologies: Definition & importance of sustainable energy, global energy consumption & environmental impact, Overview of clean energy sources that have minimal environmental impact compared to traditional fossil fuels-solar energy, wind energy, biomass energy. Sustainable transport-introduction to Electric Vehicles (EV), Technological advancements over the years in EVs, electric vehicle performance & efficiency comparison with traditional internal combustion engine vehicles, integration of autonomous technology with EVs.

UNIT-V:

Trends towards Sustainability: Waste minimization and resource recovery, waste reduction, and waste tracking systems. Recycling & waste management- Plastics recycling – Code of practice – Primary, secondary, tertiary, and quaternary recycling with examples. Mechanical recycling of commonly used plastics, such as PP, PE, PET, etc. Waste plastics as fillers. Advances towards clean chemistry-minimizing the use of traditional chemical catalysts by integrating biocatalysts (enzymes) into chemical processes. Integration of technology - application of artificial intelligence & machine learning for designing & optimization of sustainable chemical processes.

TEXT BOOKS:

1. Green Chemistry for Sustainable Engineering, Shrikaant Kulkarni, Shashikant V. Bhandari, Bancha Yingngam & A. K. Haghi, Cambridge Scholars Publishing, 2024
2. Sustainable Materials: Environmental and Engineering Perspectives, Subramanian Senthilkannan Muthu, 1st Edition, Springer, 2021
3. Green Chemistry, Theory and Practical, Paul T. Anastas and John C. Warner, Oxford University Press, 2000

REFERENCES:

1. Green Chemistry: An Introductory Text, Mike Lancaster, RSC Books
2. Sustainable Energy – Without the Hot Air, David J. C. MacKay, UIT Cambridge Ltd.
3. Green Manufacturing: Fundamentals and Applications, David A. Dornfeld and Barbara S. Linke, 1st Edition, Springer
4. Waste and Resource Management: Sustainable Handling of Waste Materials, Bernd Bilitewski, Georg Härdtle, and Klaus Marek, 4th Edition, Wiley
5. Artificial Intelligence in Chemistry and Drug Design" by Cory M. Reynolds and Alexander Tropsha, Royal Society of Chemistry, 1st Edition

ONLINE RESOURCES:

1. Coursera - Introduction to Environmental Science and Sustainability
2. edX - Applications of Artificial Intelligence in Chemistry
3. FutureLearn - Recycling: Global Practices of Sustainable Cities
4. Coursera - Plastic Waste Management

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN301) STORYTELLING FOR EFFECTIVE COMMUNICATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Should have adequate knowledge of LSRW skills

INTRODUCTION:
Effective communication is essential in all aspects of life, whether it is in personal relationships or professional settings. One powerful tool for impactful communication is storytelling as it connects to the audience/reader quickly. A well-told story can captivate an audience/reader, evoke emotion, and convey important messages in a memorable way. Storytelling creates engagement, alongside fostering creativity and flexibility which makes it an incredibly helpful tool across all types of communication. While presenting facts, figures, and logical arguments, using a suitable storytelling strategy not only yields the best results but also helps hone negotiation, team-building, and leadership skills in addition to a host of other life skills. Storytelling is associated with both verbal and nonverbal communication.

COURSE OBJECTIVES:
- To develop storytelling strategies among students
- To enable students to develop stories for various contexts
- To hone the communication skills of the students
- To develop skills to apply digital technology for storytelling purposes
- To develop life skills among the students through various stories

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Understand the storytelling strategies for various contexts
CO-2: Develop digital stories for various contexts
CO-3: Use the elements of storytelling, understand narrative techniques, and characters, and build the stories
CO-4: Hone their life skills to be applicable in real-life contexts
CO-5: Apply storytelling techniques for placement activities

UNIT-I:
Storytelling Your Way To Power
Why we tell stories
Significance of verbal and nonverbal communication while telling a story
Connect your message with the story
Matching your audience/readers to your story

UNIT-II:
Digital Storytelling
Storytelling techniques

Storytelling strategies for presentations

UNIT-III:

Elements of a Great Story

plot, narrative techniques, first person, second person, third person narration.
Assembling the building blocks
Characters and their development
End with a bang
Common mistakes storytellers make

UNIT-IV:

Life Skills through Storytelling-Sample Stories

Honing leadership skills
Team skills
Change management skills
Interpersonal skills

UNIT-V:

Storytelling for Selection Process

Self-introduction as a story
Anecdotes useful during a group discussion
Anecdotes useful during an interview
SOP -a story writing

TEXT BOOKS:

1. Using Storytelling to Effectively Communicate Data, Michael Freeman Infinite Skills, 2015
2. Communication, Sharing Our Stories of Experience, Howard Kamler, Psychological Press, 1983
3. Storytelling, Michael Wilson, Emerald Publishing, 2022

REFERENCES:

1. Digital Storytelling for Employability, Ed by: Laura Malita, Vanna Boffo, Firenze University Press, 2010
2. Storytelling with You, Cole Nussbaumer Knaflic, Wiley, 2022
3. Conversation Skills, Keith Coleman, Communication & Social Skills, 2019
4. Digital Storytelling in the Classroom, Jason. B. Ohler, Corwin, 2013
5. The Instructional Value of Digital Storytelling, Patricia McGee, Routledge, 2015

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN302) FILM ANALYSIS AND CRITICAL APPRECIATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

INTRODUCTION:
Film Analysis and Critical Appreciation is a thought-provoking Open Elective course aimed at fostering a holistic perspective essential for future engineering and technology professionals. This course is designed to transcend the realms of entertainment, providing a unique lens through which learners can develop a robust sociocultural awareness and gain exposure to humanities, enriching their interdisciplinary skills

COURSE OBJECTIVES:
- To acquire knowledge of the history and development of cinema by studying and analysing major film movements to comprehend their impact on the evolution of cinematic language
- To train students to identify and differentiate various film genres, understanding their conventions, narrative structures, and other significant aspects
- To encourage students to understand and critically evaluate key elements such as cinematography, editing, sound, and mise-en-scène in film besides recognising the nuanced use of these elements to convey meaning
- To provide students the opportunity to explore major theories of film criticism and understand how these theories contribute to the interpretation and analysis of films
- To equip students with the critical thinking skills and appropriate strategies to conduct thematic analysis by exploring how films address and convey social, cultural, and political themes and gain insights into the interplay of narrative, visuals, and sound in conveying and shaping thematic content

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Trace the historical development of cinema and understand its evolution as a distinctive art form
CO-2: Identify and analyse different film genres, their characteristics and narrative conventions to examine how genres contribute to audience expectations and influence storytelling
CO-3: Critically evaluate key elements in films, including cinematography, editing, sound, and mise-en-scène, and analyse their impact on storytelling in selected films, providing specific examples
CO-4: Comprehend major theories of film criticism, applying them to analyze and interpret selected movies for enhanced understanding of a film's meaning
CO-5: Demonstrate skills in conducting thematic analysis, examining how movies address social, cultural, and political themes

UNIT-I:
Introduction: A brief history of cinema; development of film as an art form; an overview of some major movements in world cinema: German Expressionism, Italian New Realism, French New Wave, British New Wave, Dogme 95

UNIT-II:
Film Genres
Broad Classification: Narrative, Documentary, and Avant-garde; Major genres: action, comedy, drama, romance, fantasy, horror, science fiction, biopics, detective and mystery, adventure; awareness about sub-genres, hybrids and cross-genre films; conventions and expectations within specific genres

UNIT-III:
Elements of Film: Delve into the cinematic experience from the audience's perspective by exploring the Big Four: Mise-en-scène: props, costumes, lighting, setting; Cinematography: camera angle, camera distance, camera movement; Editing: graphic match, diegesis, shots; Sound: diegetic and non-diegetic

UNIT-IV:
Theories of Film Criticism
Four Levels of Meaning: referential content, explicit content, implicit content, symptomatic content; Approaches to the study of cinema: Semiotics: Realist, Formalist, Rhetorical;
Structuralist: Mythic, Political, Feminist, Psychoanalytical, Sociological; Contextual: Auteur, Genre, Historical

UNIT-V:
Critical Analysis of Plot, Characters and Themes: Story and Plot; Linear and Non-linear narrative structure; Major character archetypes; stereotypes and tropes; Interpretation of themes; Relationship between theme and character; Role of the audience in meaning-making: subjectivity and cultural context; Questions of power, identity, ethical dilemmas, and moral conflicts; Literary adaptations in film: analysing how thematic and character elements are translated.

SUGGESTED LIST OF FILMS FOR ANALYSIS

WORLD CINEMA:

1. The Cabinet of Dr. Caligari (1920, German: Das Cabinet des Dr. Caligari; silent)
2. Mother (1926, Russian)
3. Modern Times (1936, American)
4. The Lady Vanishes (1938, British)
5. Casablanca (1942, American)
6. Bicycle Thieves (1948, Italian)
7. Breathless (1960, French: À bout de souffle)
8. Fist of Fury (1972, Chinese)
9. The Godfather (1972, American)
10. Taxi Driver (1976, American)

11. The Celebration (1998, Danish: Festen)
12. Pulp Fiction (1994, American)
13. Charlie and the Chocolate Factory (2005, American)
14. Inception (2010, American)
15. The Social Network (2010, American)
16. Barbie (2023)

INDIAN CINEMA:

1. Harischandra (1913)
2. Pather Panchali (1955)
3. Mayabazaar (1957)
4. Sholay (1975)
5. Dilwale Dulhaniya Le Jayenge (1995)
6. Monsoon Wedding (2001)
7. Anniyan/ Aparichitudu (2005)
8. Tare Zameen Par (2007)
9. The Lunchbox (2013)
10. Bahubali – The Beginning (2015)
11. Awe(2018)
12. RRR (2022)
13. 12th Fail (2023)

REFERENCES:

1. It's Just a Movie: A Teaching Essay for Introductory Media Classes, Smith, Greg M. Cinema Journal, vol. 41 no. 1, 2001, p. 127-134. Project MUSE, https://doi.org/10.1353/cj.2001.0025
2. The Art of Watching Films, Boggs, J. M., & Petrie, D. W., 7th edition. New York: McGraw-Hill, 2008.
3. Piper, Jim. Get The Picture? US: Allworth Press, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN401) CROSS-CULTURAL COMMUNICATION THROUGH WORLD LITERATURE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Adequate Listening, Speaking, Reading, Writing (LSRW) skills

INTRODUCTION:
In this course, we will be critically exploring literature created by writers from all over the world. We will also use the work to understand different cultures around the world with the intention to grasp cross-cultural communication cues. With globalization marching fast, it is essential for the present students to comprehend the cultures of different nations. We will embark on our journey with a mind for understanding and exploring cultures and cross-influences that show up in the literature of that place. A part of this journey will, then, include comprehending and comparing the cultural communication across these nations, and exploring the evolution of societies and nation–states. This journey will allow engineering students to comprehend the cultures, societies, and human psychology of individuals across the globe. This understanding will help them become aware of the cultures, people, and societies of different nations of the world and can shape them as global citizens and competent communicators with a good understanding of cross-cultural communication.
We will make our journey through the medium of research groups, panel presentations, seminar discussions, critical writing, and exams.

COURSE OBJECTIVES:
- To develop open- and fair-minded thinking skills for the analysis of societies/cultures/nations
- To examine how cultures have shaped the literature of nations
- To understand different cultures through a study of literature and society there by analyzing cross cultural communication
- To equip students with cross cultural communication
- To train students to become global citizens

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Open and fair-minded thinking skills and will be able to analyse societies/cultures/nations
CO-2: Capacity to examine the cultures that have shaped the literature of different nations
CO-3: Ability to understand world cultures and societal issues with an intention to grasp cross-cultural communication
CO-4: Equipped to understand the nuances of cross-cultural communication
CO-5: Capable of applying the knowledge of cross-cultural communication strategies to real-life scenarios

UNIT-I:
Introduction to Cross-Cultural Communication
American Literature:

1. "America and I" a short story by Anzia Yezierska
2. "Notes of a Native Son" an essay by James Baldwin

UNIT-II:
Basic Concepts and Definition of Culture and Communication
African Literature:

1. "A Private Experience" a short story by Chimamanda Ngozi Adichie
2. "Civilian and Soldier" a poem by Wole Soyinka

UNIT-III:
Examining Variation of Faiths and Values in Relation to Cross-Cultural Communication
Russian Literature:

1. "The Beggar Boy at Christ's Christmas Tree" a short story by Fyodor Dostoevsky
2. "The Dragonfly & the Ant" a poem by Ivan Krylov's.

UNIT-IV:
Barriers in Cross Communication Contexts
British Literature:

1. "On Education" an essay by Bertrand Russell
2. "An Irish Engagement" –a one act play by Walter Watts

UNIT-V:
Aspects of Communication Affected by Culture
Asian Literature:

1. A Matrimonial Fraud-A Chinese story.
2. The Idea of an Ever-ever Land, An Excerpt from Shashi Tharoor's Essay in 'Left, Right, and Centre

TEXT BOOKS:

1. The Handbook of Communication in Cross-cultural Perspective, Donal Carbaugh, Taylor & Francis, 2016
2. Cross cultural Communication Global Perspective, N. L. Gupta, Concept Publishing,1998
3. Communicating and Adapting Across Cultures: Living and Working in the Global Village, Riall Nolan, ABC-CLIO, 1999

REFERENCES:

1. How I Found America: Collected Stories, Yezierska Anzia, Persea, 2003
2. Notes of a Native Son, Baldwin James, Beacon Press, 2012
3. The Thing around Your Neck, Chimamanda Ngozi Adichie, The Guardian: The Observer, 2008
4. Civilian and Soldier, Wole Soyinka, Emory University, 1996
5. The Heavenly Christmas Tree, Fyodor Dostoevsky, Creative Co., 1992

ONLINE RESOURCES:

1. https://ia601609.us.archive.org/10/items/cu31924010707440/cu31924010707440.pdf- Chinese short stories
2. https://ruverses.com/ivan-krylov/dragonfly-and-the-ant/3704/
3. https://dreamtopper.in/wp-content/uploads/2023/05/Broken-Images-12th-Kaleidoscope-Book.pdf

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN402) BUSINESS COMMUNICATION

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic Proficiency in Listening, Speaking, Reading, Writing (LSRW) Skills

COURSE OBJECTIVES:
- To express oneself in English with greater fluency, accuracy, and confidence
- To exhibit good team-building skills
- To develop skills and techniques (speaking & writing) for effective communication
- To make effective presentations
- To conduct oneself professionally in a workplace environment

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Communicate effectively and confidently
CO-2: Participate in Team building, and work efficiently in teams
CO-3: Comprehend and practice suitable workplace etiquette
CO-4: Draft business letters, emails, and memos using appropriate language
CO-5: Participate in and contribute to meetings constructively

UNIT-I:
Effective Communication:
a) Fundamentals of Effective Communication
b) How to sell your ideas
c) Types of communication networks
d) Barriers of Communication
e) Business vocabulary 1

UNIT-II:
Effective Communication for Team Building:
a) Importance of Groups in an Organization; Interactions in a Group, Group Decision Taking
b) Stages of Team Building, Interaction with the Team
c) Group Dynamics, Managing Conflicts in the Team
d) Problem-solving, Decision Making and Interpersonal skills
e) Business Vocabulary 2

UNIT-III:
Office Etiquette:
a) Personal Grooming
b) Presentation Etiquette
c) Spaces & Gender Differences, Inclusivity

d) Business Vocabulary 3

UNIT-IV:

Effective Writing Skills:

a) 7 Cs of Communication
b) Writing Process: Pre-writing, writing & Post-writing
c) Neutral and Positive messages
d) Writing emails, Business Letters, Circulars, Notices & Memos
e) Communicating in the Digital world - netiquette

UNIT-V:

Business Meetings:

a) Conducting and participating in meetings
b) Writing Agenda & Minutes of the meeting
c) Etiquette in meetings

TEXT BOOKS:

1. Effective Business Communication, Murphy Herta A., Herbert Hildebrandt, Jane Thomas, 7th Edition, Tata McGraw-Hill, 2008
2. Effective Emails: The Secret to Straightforward Communication at Work, Fenning, Chris, N. P., Alignment Group Limited, 2022

REFERENCES:

1. Talk Like TED: The 9 Public Speaking Secrets of the World's Top Minds, Gallo, Carmine, Pan Macmillan, 2014
2. Made to Stick: Why Some Ideas Survive and Others Die, Heath, Chip, and Heath, Dan, Random House Publishing Group, 2007
3. Team Building: Proven Strategies for Improving Team Performance, Dyer, W. Gibb, et al, Wiley, 2013

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1EN303) CREATIVE WRITING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

INTRODUCTION:
This Open Elective course on Creative Writing is designed to equip students of engineering and technology with effective written communication and the capacity to approach problem-solving and innovation with a creative mindset. The course enables students to refine their ability to convey complex ideas with clarity and creativity by delving into the intricacies of figurative language, narrative voice, and multiple perspectives. Beyond the craft of writing, the course addresses critical aspects of the writing process, from idea generation to self-evaluation, peer feedback, and ethical considerations. Students will also gain insights into current trends, emerging genres, and the impact of technology on the ever-evolving landscape of creative writing.

COURSE OBJECTIVES:
- To nurture creativity and develop a unique writing voice
- To equip students with the fundamental elements and techniques of effective creative writing across various genres
- To guide students through the writing process, fostering critical thinking, revision, and editing skills
- To prepare students for potential publication or sharing their work, exploring different avenues and ethical considerations
- To spark curiosity and engagement with contemporary trends and the future of creative writing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Create original works of short fiction, non-fiction (memoir or travelogue), and/or poetry demonstrating mastery of genre conventions and narrative techniques
CO-2: Analyze and apply elements of creative writing, including plot, character development, setting, imagery, and voice, to enhance their writing
CO-3: Effectively engage in the writing process by brainstorming, outlining, drafting, revising, editing, and proofreading their work
CO-4: Demonstrate an understanding of different publication options and ethical considerations in creative writing
CO-5: Explore current trends and future potential of creative writing, experimenting with emerging genres and formats

UNIT-I:
Introduction to Creative Writing and Genres: What is Creative Writing? Different types such as fiction, non-fiction (memoir and travelogue), poetry, and drama; Role of imagination; Discovering your voice: identifying your unique writing style and

perspective; Popular genres, their key features, and conventions; Reading as a writer: analysing published works to learn from masters and discover writing techniques

UNIT-II:
Elements of Creative Writing: Building strong plots, developing compelling characters, crafting vivid settings, and mastering the art of dialogue; Figurative language and imagery: exploring metaphors, similes, personification, and other relevant literary devices; Point of view, narrative voice, and multiple perspectives

UNIT-III:
Writing Process 1 - Strategies and Techniques: Brainstorming and idea generation: techniques for overcoming writer's block and generating fresh ideas; Outlining and character development: planning the story structure and creating believable characters with depth and motivation; Scene building and description: learning to craft immersive scenes that engage the reader's senses; Genre-specific strategies; Ethical considerations in creative writing: exploring issues like plagiarism, cultural appropriation, and responsible representation

UNIT-IV:
Writing Process 2 - Review, Revise, Edit, and Proofread: Self-evaluation, peer feedback and incorporating constructive criticism; Revision and editing: strategies for tightening prose, fixing plot holes, and polishing writing for clarity and flow; Copyediting and proofreading: correcting typos, grammatical errors, and formatting inconsistencies; Preparing for publication: understanding different publishing methods, agent queries, and self-publishing options

UNIT-V:
Current Trends in Creative Writing: Emerging genres and popular trends such as flash fiction, graphic novels, and online storytelling platforms; Impact of technology on writing, readership, and publishing models; New forms of narrative and the evolving landscape of creative writing.

REFERENCES:

1. Glossary of Literary Terms, Abrams M. H., Wadsworth Publishing Company, 2005
2. The Creative Writing Course-Book, Bell Julia and Magrs Paul, Macmillan, 2001
3. The Handbook of Creative Writing, Earnshaw, Steven (Ed), EUP, 2007

SUGGESTED READINGS:

1. Atwood, Margaret. Negotiating with the Dead: A Writer on Writing. Cambridge: CUP, 2002
2. Bell, James Scott. How to Write Dazzling Dialogue.CA: Compendium Press, 2014
3. Egri, Lajos. The Art of Dramatic Writing. NY: Simon and Schuster, 1960
4. Gardner, John. The Art of Fiction. New York: Vintage, 1991
5. Johnson, Jeannie. Why Write Poetry? US:F. D. Univ. Press, 2007
6. Mezo, Richard E. Fire i' the Blood: A Handbook of Figurative Language. USA: Universal Publishers.1999
7. Strunk, William and White, E. B. The Elements of Style. London: Longman, 1999
8. Turabian, Kate L. A Manual for Writers. Chicago: Univ. of Chicago Press, 2007
9. Ueland, Brenda. If You Want to Write. India: General Press, 2019

10. Zinsser, William. On Writing Well. New York: Harper Collins, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG302) PERSONAL FINANCE AND TAX PLANNING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basic concepts of personal finance and describe steps in personal management process
- To create awareness on investment, speculation & gambling and discuss about security trading and settlement
- To describe investment avenues like financial assets and money market instruments for making investment
- To explain investments alternatives like mutual funds and insurance options for making investment
- To acquaint with the basic concepts of income tax and describing various sources of income and e-filing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Explore the various concepts of personal finance and effectively implement personal management process
CO-2: Differentiate between investment, speculation & gambling and able to demonstrate about security trading and settlement
CO-3: Assess various investment avenues and able to implement effective investment
CO-4: Analyze various types mutual fund schemes and insurance plans
CO-5: Assess various concepts of income tax and able to file income tax returns through e-filing

UNIT-I:
Introduction to Personal Finance: Definition, Importance & Need of Personal Finance, Key areas of Personal Financial Management, Personal Financial Management Processes.

UNIT-II:
Introduction to Investment Decisions: Investment, Speculation and Gambling, Features of Investment, Investment Process, the Investment Environment, Securities Market of India, Securities Trading and Settlement, Types of Orders, Margin Trading.

UNIT-III:
Investment Alternatives-I: Investment Avenues: Financial Assets, Capital market instruments- Stocks, Bonds, Commodities and Derivatives, Post office Deposits, Bank Deposits.
Money Market Instruments: Need and Importance, Types-Commercial Papers, Treasury bills, Certificate of Deposits, Bills of Exchange, Mortgage loans.
Other Investment Avenues: Gold, Real estate, PPF, NPS and SIP.

UNIT-IV:

Investment Alternatives-II: Introduction to Mutual funds: Definitions of Mutual funds, Structure of Mutual funds, advantages and disadvantages of Mutual funds, Types of Mutual funds. AMFI.

Insurance: IRDA; definition and characteristics of Insurance, Types of Insurance, Life Insurance, General Insurance and Health Insurance.

UNIT-V:

Introduction to Taxation: Introduction, types of taxes, direct and indirect taxes, Key terms of IT.

Sources of Income: Income from salaries, Income from House Property, Income and Profession and Business and Income from other sources.

Assessment of Individual Tax- Total Income – deductions – Process of E-filing.

TEXT BOOKS:

1. Personal Finance, Jeff Madura, 7th Edition, Pearson, 2020
2. Personal Financial Planning, Randall S. Billingsley, Lawrence J. Gitman, 15th Edition, Cengage, 2021
3. Direct Taxes Law & Practice, Vinod K. Singhania, Kapil Singhania, Taxmann, 2023

REFERENCES:

1. Handbook on Income Tax, CA Raj K. Agarwal, 9th Edition, Bharat, 2024
2. Personal Finance, Arthur J. Keown, 8th Edition, Pearson, 2019
3. Personal Finance Planning, S. Murali, K.R. Subba Krishna, Himalaya Publishing House, 2019
4. Systematic Approach to Income Tax, Girish Ahuja, Ravi Gupta, 48th Edition, Commercial Publishers, 2023

B.Tech. V Semester

(22OE1MG303) CORPORATE FINANCE

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To provide basic functions of financial management and describing the concepts and techniques of time value of money and its impact on decisions of financial management
- To describe various aspects of Investment decision process and explain various techniques of capital budgeting Decisions.
- To discuss/learn long term and short-term sources of financing
- To explain capitalization and capital structures and different types of leverages and its impact on profitability or earnings of the organization
- To elucidate/ explain the basic concepts of working capital estimation & its importance and explain about various strategies of receivable and inventory management

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Analyze the various concepts of finance function and able to distinguish between present value and future value of cash flows and its impact on financial decision

CO-2: Examine various capital expenditure decisions and its impact on profitability of the organization.

CO-3: Explore various sources of finance and optimal capital mix

CO-4: Assess different types of leverages and the impact of leverage on earnings of the organization

CO-5: Analyze various concepts of working capital and able to estimate working capital required by the organization for smooth running of its operation

UNIT-I:

Introduction to Financial Management: Nature, scope, objectives, and goals of finance function, concept of time value of money- future value and present value, the basic valuation model.

UNIT-II:

Financial Planning and Strategy: Introduction, strategic decision making and planning, interface between financial planning and strategic management, financial forecasting, basics of capital budgeting: meaning, features and capital budgeting process, capital budgeting decisions techniques- traditional methods: payback period, accounting rate of return, modern methods: net present value, internal rate of return, and profitability index.

UNIT-III:

Sources of Financing: Introduction to financial market-role of financial markets, segments of financial market, product and services, long term sources of finance-equity, preference shares, debentures, internal finance, loan financing, short term sources of finances.

UNIT-IV:

Capitalization and Capital structures: Concept of capitalization, types of capitalization, capital structure, capital structure vs. financial structure, financial leverage, operating leverage and composite leverage.

UNIT-V:

Working Capital Management: Introduction to working capital, meaning and concept of working capital, gross working capital and net working capital, operating cycle nature and characteristics of working capital, factors affecting working capital management, estimating working capital.

Receivables management- meaning and importance, strategies of receivable management. Inventory management- definition of inventory, need and techniques of inventory management.

TEXT BOOKS:

1. Financial Management, Prasanna Chandra, 11th Edition, McGraw-Hill, 2022
2. Financial Management: Text and Problems, M. Y. Khan, P. K. Jain, 8th Edition, McGraw-Hill, 2019
3. Financial Management, I. M. Pandey, 11th Edition, Vikas Publications, 2015

REFERENCES:

1. Financial Management, Eugene F. Brigham Michael C. Ehrhardt, 14th Edition, Cengage Learning, 2015
2. Management Accounting, R. K. Sharma and Shashi K. Gupta, Kalyani Publications, 2017
3. Financial Management, S. N. Maheshwari, Sultan Chand & Sons, 2019

B.Tech. V Semester

(22OE1MG304) COST AND MANAGEMENT ACCOUNTANCY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To describe basic concepts of cost and management accounting and key differences between financial accounting, cost accounting and management accounting
- To provide various techniques of cost accounting for various industries to ascertain price of a product or service
- To discuss about concept of process costing and treatment of losses and ascertaining cost of by products and joint products
- To create awareness on standard costing technique and concepts of analysis of variance and its role in cost controlling
- To explain steps in budgetary control and able to prepare various types of budgets

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Assess the importance of cost and management accounting and able to differentiate between various types of accounting

CO-2: Analyse various cost accounting techniques and identify cost of a product or service

CO-3: Asses the importance and applications of process costing and differentiate between normal and abnormal losses and treatment on products and services

CO-4: Apply concepts of standard costing and able to calculate various types of variances

CO-5: Demonstrate the steps in budgetary control and able to prepare various types of budgets

UNIT-I:

Introduction to Management and Cost Accounting: Introduction to management accounting-definition, objective, nature and scope of management accounting, cost accounting- cost, costing and cost accounting, objectives and importance of cost accounting, classification of costs; management accounting vs. cost accounting vs. financial accounting, role of accounting information in planning and control.

UNIT-II:

Costing for Specific Industries & Marginal Costing: Costing for specific Industries-Unit costing, job costing, cost sheet and tender, machine hour rate.

Marginal costing- Features, advantages and limitations of marginal costing, break-even analysis-assumptions, limitations, and applications of marginal costing: make or buy decisions, key or limiting factor, product mix decisions.

UNIT-III:

Process Costing: Process Costing-features, applications, advantages and limitations of process costing, cost of process – process losses and its treatment, accounting for joint product and by-product.

UNIT-IV:

Standard Costing and Variance Analysis

Standard Costing: Meaning, and importance, Variance Analysis-types-material variance, labour variance and sales variance.

UNIT-V:

Budgets and Budgetary Control: Budgetary Control- Budget, budgetary control, steps in budgetary control, different types of budgets- sales budget, Cash budget, Flexible budget, Production budget, Performance budget, Zero Based Budgeting.

TEXT BOOKS:

1. Cost Accounting, M. Y. Khan and P. K. Jain, 2nd Edition, McGraw-Hill Education, 2017
2. Management Accounting, R. K. Sharma and Shashi K. Gupta, Kalyani Publications, 2017
3. A Text book of Cost and Management Accounting, M. N. Arora, Vikas Publishing, 2021

REFERENCES:

1. Cost and Management Accountancy, P. C. Tulsian, S. Chand, 2022
2. Cost Accounting: Theory and Practice, Bhabatosh Benerjee, 14th Revised Edition, PHI, 2022
3. Cost and Management Accounting, Ravi M. Kishore, 6th Edition, Taxmann, 2021

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG301) FUNDAMENTALS OF MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the principles, functions, theories and practices of different management areas and to provide them with practical exposure to cases of success/failure in business
- To explain the importance of planning, decision making in an organization
- To discuss the various organizational structures, authority and responsibility, line& staff relationships in an organization
- To understand recruitment, selection process and discuss the need of directing in an organization
- To discuss the differences between coordination and cooperation and explain the controlling function

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Apply principles and theories to improve the practice of management
CO-2: Devise the plans and take the right decisions based on the environmental analysis
CO-3: Assess the types of organizational structures and evaluate the impact on employees for organizational effectiveness
CO-4: Undertake full and fair recruitment and selection systematically and compare and contrast leader vs manager
CO-5: Differentiate between coordination and cooperation and the different types of control in organization

UNIT-I:
Introduction to Management: Concept, nature and scope, importance of management, hierarchy/levels of management, management skills and managerial competencies, Evolution of management thought: Classical Theories- Scientific Management, Administrative Management, Neo-Classical Theories- Hierarchy of needs, Two Factor Theory, Hawthorne Experiments, Theory X & Theory Y, Modern Theories: Systems Theory and Contingency Theory, Introduction to Functions (POSDCORB) of Management.

UNIT-II:
Planning and Decision Making: Planning- Concept and importance, planning process, Essentials of a Good plan, Types of plans, planning tools and techniques, Management by Objectives, environmental analysis and diagnosis.
Decision Making-Concept and process, types of Decision-making, Decision-Making Model.

UNIT-III:

Organizing: Concept, nature, Principles, span of Management, organizational structure, types of organizational structures- mechanistic and organic and their merits and demerits, Authority and responsibility - delegation, centralization and decentralization of authority, line and staff relationship.

UNIT-IV:

Staffing and Directing: Staffing- Nature of staffing function, Human Resource Planning, Sources of Recruitment, recruitment process and types. Selection - process, types of selection, job offer, placement and induction

Directing-Need for directing, principles and characteristics of directing, Leader Vs Manager.

UNIT-V:

Coordination and Controlling: Coordination–Need, types and techniques of Coordination-Distinction between coordination and co-operation-Requisites for excellent co-ordination

Controlling- Importance of controlling, characteristics of control, steps, resistance to control, design of effective control system and types.

TEXT BOOKS:

1. Essentials of Management: An International, Innovation and Leadership Perspective, Harold Koontz & Heini Weihrich, 11th Edition, Tata McGraw-Hill Education, 2020
2. Fundamentals of Management, Stephen P. Robbins, Mary Coulter, David De Cenzo, 9th Edition, Pearson Education, 2016
3. Introduction to Management, John R. Schermerhorn., Daniel G. Bachrach, 13th Edition, Wiley, 2016

REFERENCES:

1. Principles of Management, Anil Bhat, Arya Kumar, Oxford University Press, 2018
2. Principles and Practices of Management and Organizational Behaviour, Chandrani Singh, Aditi Khatri, Sage Publications, 2016
3. Principles of Management, T. Ramasamy, Himalaya Publishing House, 2018

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG306) MARKETING MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To understand the basic concepts of marketing and market research process
- To explain the aspects of analysing market opportunities, customer value and marketing mix
- To elucidate on designing a customer driven strategy through marketing segmentation, targeting and positioning
- To describe the significance of distribution decisions, pricing, promotion and communication strategies
- To discuss the trends in contemporary marketing

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Impart knowledge on marketing process, mix and environment
CO-2: Analyse the market opportunities and customer value with the use of marketing mix elements
CO-3: Create the segmentation, targeting and positioning of the products and services
CO-4: Find the right mix of pricing, promotion and marketing channels and evaluate the communication strategies
CO-5: Assess the trends in contemporary marketing

UNIT-I:
Introduction to Marketing: Introduction to Marketing, Core Marketing Concepts, Marketing environment, Marketing Strategies and Plans, Market research, market research process, Marketing vs Selling.

UNIT-II:
Analyzing Marketing Opportunities, Customer Value and Marketing Mix: Consumer Decision-making, Building Customer Value, Analyzing Consumer Markets, Consumer Behaviour, Cultural, Social & Personal Factors, Developing Products & Brands, Product Levels; Classifying Products, Product Range, Product Line & Product Mix, Product Life Cycle, New Product Development, New Service Development, Stages of Product/ Service innovation development, The Process of Adoption, Branding.

UNIT-III:
Designing a Customer Driven Strategy: Market Segmentation, Targeting, Positioning Process, Segmentation of Consumer Market, Business Market, Requirement for Effective Segmentation, Market Targeting, Evaluating Market Segmentation, Selecting Target Market Segmentation, Positioning and Repositioning, Positioning Maps, Product Positioning Strategies.

UNIT-IV:

Distribution Decisions, Promotion, Pricing & Communication Strategies Marketing Channels, Channel Intermediates and Functions, Channel Structure, Channel for Consumer Products, Business and Industrial Products, Alternative Channel, Channel Strategy Decisions.

The Promotional Mix, Advertising, Public Relations, Sales Promotion, Personal Selling, Direct and Online Marketing.

Pricing- Factors affecting pricing, pricing methods and strategies

Marketing Communication: Communication Process, Communication Promotion Mix, Factors affecting the Promotion Mix.

UNIT-V:

Contemporary Marketing: Current trends in Marketing, Customer Relationship Management, Trend Markets: Digital Marketing and platforms, Rural Marketing and its trends, International Marketing and its importance, Green Marketing-Principles &Practices, concept of Trail Marketing and services, Search Engine Optimisation.

TEXT BOOKS:

1. Principles of Marketing, Philip Kotler, Gray Armstrong, Prafulla Agnihotri, 18th Edition, Pearson Education, 2020
2. Marketing: An Introduction, Rosalind Masterson, Nichola Phillips, David Pickton, 5th Edition, Sage Publications, 2021
3. Principles of Marketing: A South Asian Perspective, Lamb, Hair, Sharma, McDaniel, Cengage Learning, 2016

REFERENCES:

1. Marketing 4.0: Moving from Traditional to Digital, Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Wiley, 2016
2. Marketing Management, Arun Kumar & N. Meenakshi, 3rd Edition, Vikas Publications, 2016
3. Marketing Management, Ramaswamy, Nama Kumari, 6th Edition, Sage Publications, 2018

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

B.Tech. V Semester

(22OE1MG305) HUMAN RESOURCE MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:
- To explain the concepts, significance and role of human resource management in an organization
- To describe the aspects of job analysis, job evaluation and manpower planning
- To understand the techniques of recruitment and process of selection
- To analyze the significance of training & development and succession planning
- To learn the concepts of performance management, appraisals and compensation management

COURSE OUTCOMES: After completion of the course, the student should be able to
CO-1: Appreciate the concepts, role and functions of HRM and the need of HR to act as a strategic business partner of the organization
CO-2: Relate the need for job analysis and job evaluation and, their significance in human resources planning
CO-3: Apply the practices of recruitment and the process of selection in relevance with needs of the organization
CO-4: Design the suitable methods of employee training & development in accordance with the emerging trends and necessities
CO-5: Analyze the system of performance management and job evaluation in an organisation and suggest applicable changes where necessary, for the improvement of the organisation and employee efficiency

UNIT-I:
Introduction to HRM: Definition, Nature & scope of Human Resource Management - Evolution of Human Resource Management, Objectives, Functions, Importance of Human Resource Management, Challenges of Human Resource Management, Contemporary role of Human Resource Manager, Concept of e-HRM.

UNIT-II:
Job Analysis, & Human Resource Planning: Concept of Job Analysis - Job Description and Specifications, Introduction to Human Resource Planning, Importance, Objectives of HR Planning, Human Resource Planning Process.

UNIT-III:
Recruitment & Selection: Introduction to Recruitment and Selection, Concepts of Recruitment – Recruitment Techniques, Sources of Recruitment. Selection - Types of Selection Methods, Selection Process, on-boarding and Induction, Exit Process.

UNIT-IV:

Training and Development: Nature and Scope of Training and Development - Objectives, Methods, Process, Analysis of Training Needs & Designing the Training Program, Implementation, Feedback.

Development- Training Vs Development, Management Development, Process, Evaluation of Development Programs, Succession Planning.

UNIT-V:

Performance and Compensation Management: Concept and process of Performance Management, Performance Appraisal-Definition, Objectives, Process and Methods, Mentoring and Coaching.

Compensation Management: Factors influencing and challenges, Job Evaluation - Definition, Objectives, Process and Methods, Components of CTC.

TEXT BOOKS:

1. Human Resource Management: Text and Cases, K. Aswathappa, 8th Edition, Tata McGraw-Hill, 2017
2. Essentials of Human Resource Management, P. Subba Rao, 6th Edition, Himalaya Publishing, 2021
3. Human Resource Management, Gary Dessler, Biju Varkkey, 4th Edition, Pearson, 2017

REFERENCES:

1. Human Resource Management, Biswajeet Pattanayak, 5th Edition, 2018
2. Human Resource Management, Robert L. Mathis, John H. Jackson, Manas Ranjan Tripathy, Cengage Learning 2016
3. Human Resource Management, Text and Cases, Sharon Pande and Swapnalekha Basak, 2nd Edition, Vikas Publishing, 2016